

AI AUTOMOTIVE INDUSTRIES

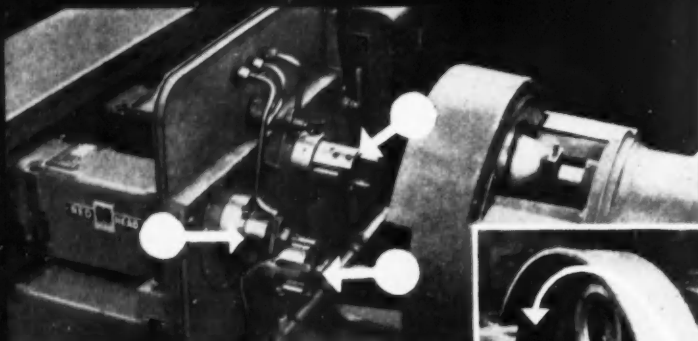
APRIL 15, 1953

AUTOMOTIVE and AVIATION MANUFACTURING
CIVILIAN AND DEFENSE
ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue . . . Development of Special Machinery . . . Warner
Gear's Power Steering . . . Cold Working of
Metal . . . Sabre Jet Fighter . . . Balancing
Mack Driveshafts . . . Swiss Automobile Show

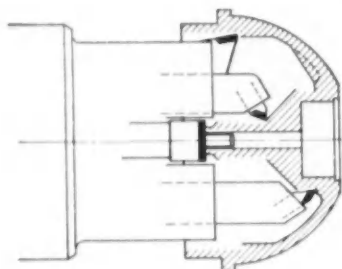
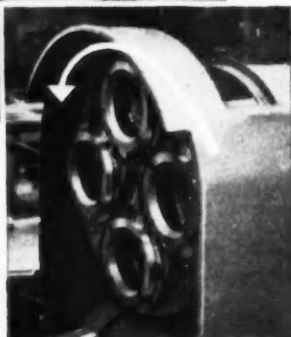
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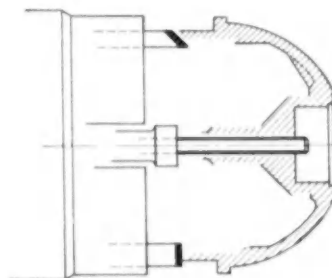
The three multiple-tool boringhead stations shown above perform a variety of precision finishing operations on eight different surfaces of fan motor end frames. Small cylinder at top station is an unloading ejector.

The workholding fixture shown at the right is rotated in 90° increments, presenting parts to each of the three boringhead stations in proper sequence, as indicated below.



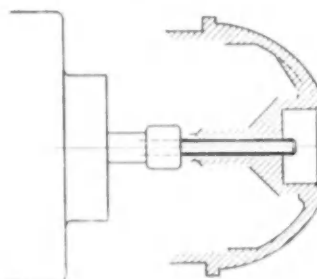
STATION

Bore, turn two diameters, face shaft end and start reaming of center hole.



STATION

Face and chamfer end of frame — rough ream full length of center hole.



STATION

Finish ream center hole.

puts fan-motor housings on a high production basis

**Heald Model 221 Bore-Matic
bores, reams, turns, faces and
chamfers motor end frames
in continuous, consecutive cycle**

Here's another example of how Heald engineering found the answer to a high-precision multiple boring problem.

By means of the four-station rotary indexing fixture shown above, parts are presented in sequence to each of three boringhead work stations. The fourth station, at the top of the fixture, is used for loading and unloading.

For the long, small diameter center hole on this particular job, a reamer is used in preference to a boring tool in order to avoid chatter problems and assure a smooth, clean bore. The operations performed at each station are shown at the left. The entire machine cycle is fully automatic and parts are loaded and unloaded at the top station while the other three stations are boring. A completely finished part is brought to the unloading station at each 90° rotation of the indexing fixture.

Remember — when it comes to precision finishing, it pays to come to Heald.

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

Case Study
No. 2240-96 in
**PRECISION
PRODUCTION**

WORCESTER 6, MASSACHUSETTS

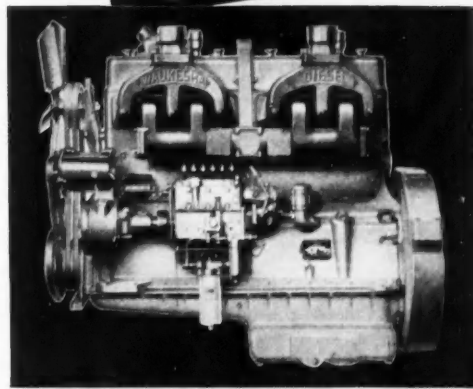
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...PAYLOAD POWER WAUKESHA Diesel

● Where hauling is heaviest, and hardest . . . where turns twist, and grades are steep and stiff—Waukesha Super-Duty Diesels take trucks through, and come back for more. The truck shown hauls an average payload of 30 tons at an elevation of 6400 feet from a quarter to a half mile 16 hours a day. It makes about 38 trips a day. Waukesha has put all this payload performance into its Diesels—by 25 years of Diesel development and research—with many exclusive Waukesha features. The patented spherical combustion chamber controls combustion to meet operation needs—giving the engine lively responsive acceleration, smoothness and complete clean burning for high fuel economy and low maintenance. For the *how* and *why* Diesel details, send for Bulletin 1415.

162R



WAKD Super-Duty DIESEL—6 cylinders, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displ.

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Heat-Resisting Applications



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67 Wall Street, New York 5, N. Y.

A CHILTON MAGAZINE

AI

PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

APRIL 15, 1953

VOL. 108, NO. 8

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MEMBER



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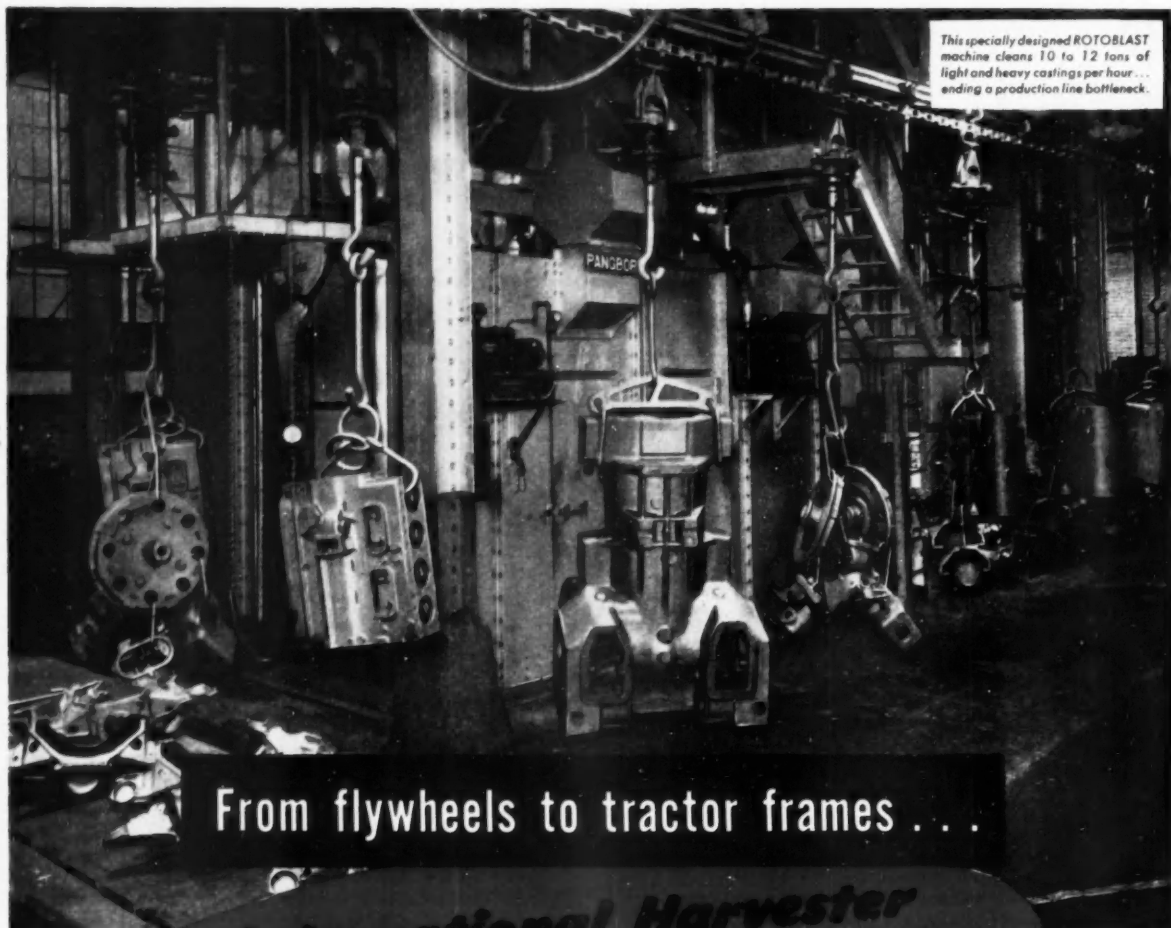
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AUTOMOTIVE INDUSTRIES, April 15, 1953



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cleans 10-12 tons per hour with*
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AT the International Harvester Company's Tractor Works Foundry, the blast rooms and tumbling mills couldn't clean tractor frames, engine blocks, transmissions and bolsters fast enough to keep pace with production. Pangborn engineers were called in . . . they studied the problem . . . and designed the special blast cleaning machine you see here. Automatically handling smaller light work and heavy pieces simultaneously, it ROTOBLASTS 10 to 12 tons per hour. No bottleneck here!

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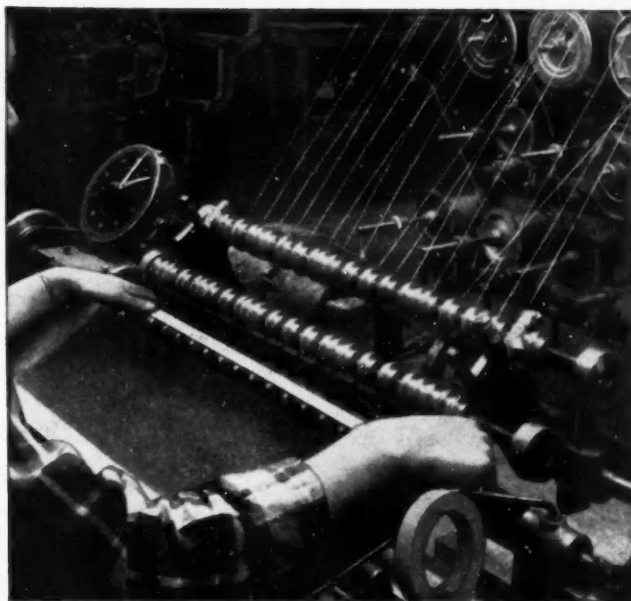
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with the right equipment for every job

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...and they're paper!



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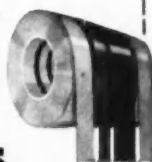
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	652 Black Crepe	654 Black Flatback
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Tensile Strength (warp, lbs./inch width)	20	50
Adhesion, Steel	25	45
Adhesion, Bakelite Grade XX (oz./inch width)	30	50
Tack Level	5.0	6.0
Dielectric Strength (volts)	1500	2000
Insulation Resistance (megohms)	>100,000	>100,000
Electrolytic Corrosion (Micromicromhos)	0.15x10 ⁶	0.15x10 ⁶
Electrolytic Corrosion Factor	0.90	0.90
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We are having trouble that may be caused by an inadequate hydraulic oil.

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VARNISH NO OBSTACLE—This is one of the many presses of various sizes which form joints in abrasive sanding belts for production use in the automobile, jet engine and woodworking industries, as well as many others. Six years ago equipment like this press needed costly maintenance at frequent intervals because of varnish formation. Then a Sunvis H.D. 700 Oil was adopted as the hydraulic medium, and the trouble disappeared like magic.



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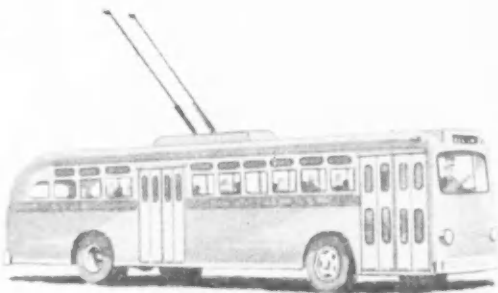
moving automotive industry — meeting the challenge of engineering advances with new products, improved designs and a research staff constantly alert to specialized requirements of the manufacturer.

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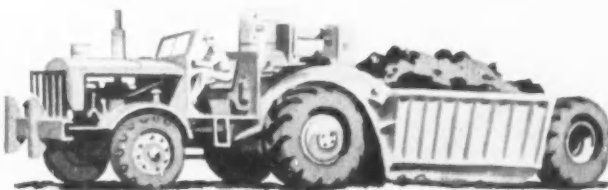


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HYDRAPOWER

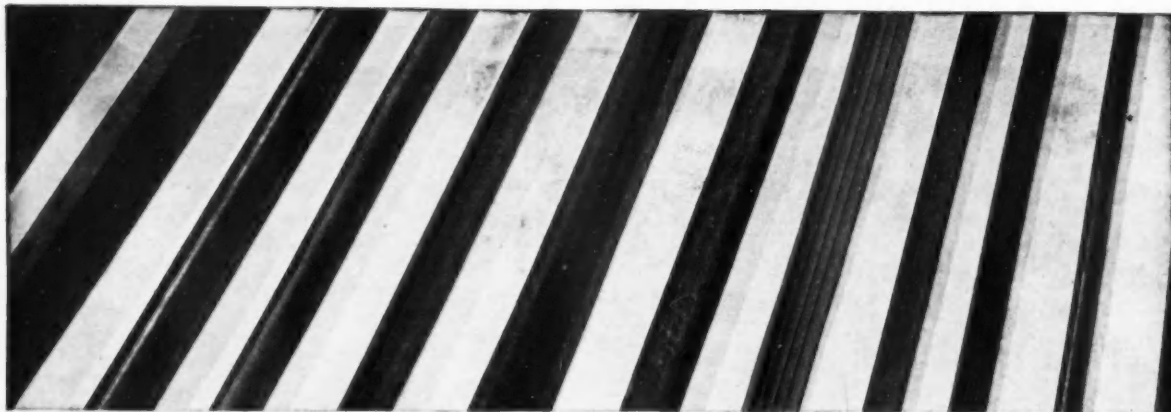
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Cam & Lever STEERING

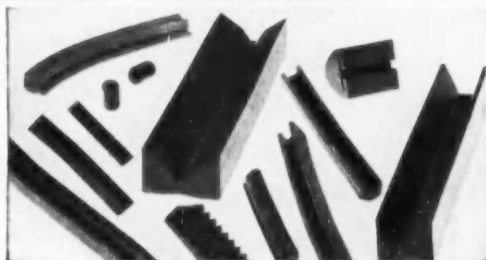
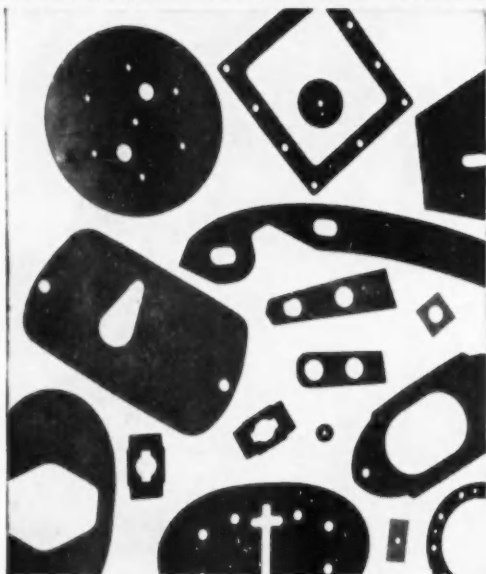


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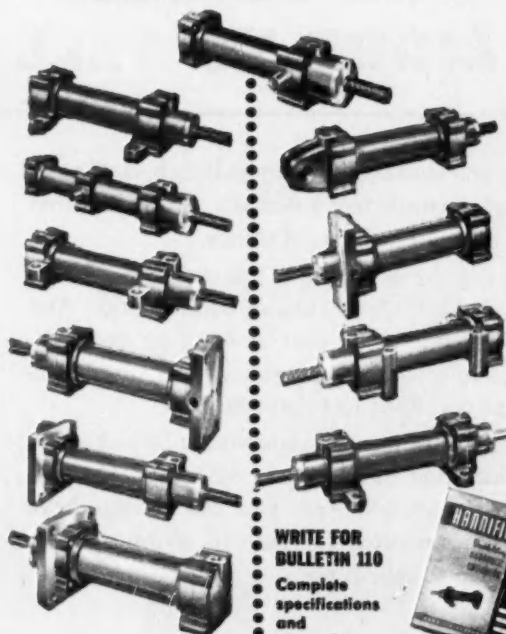
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Confined gaskets—seal positively, cannot extrude.

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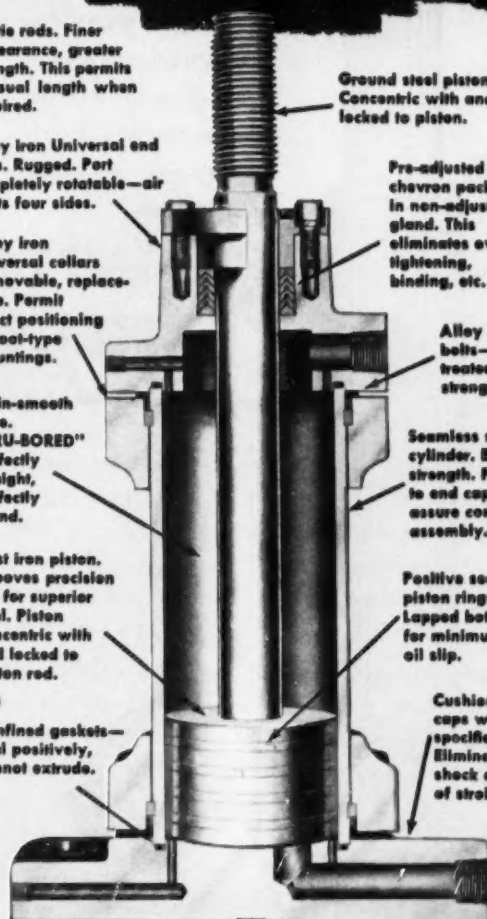
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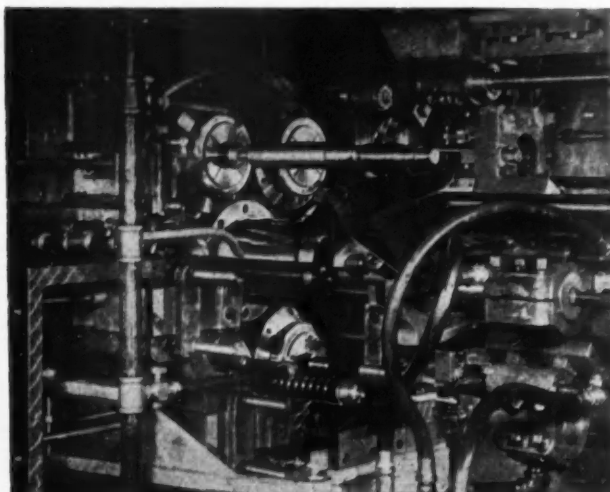
Positive seal piston rings. Lapped both sides for minimum oil slip.

Cushioned caps when specified. Eliminate shock at end of stroke.

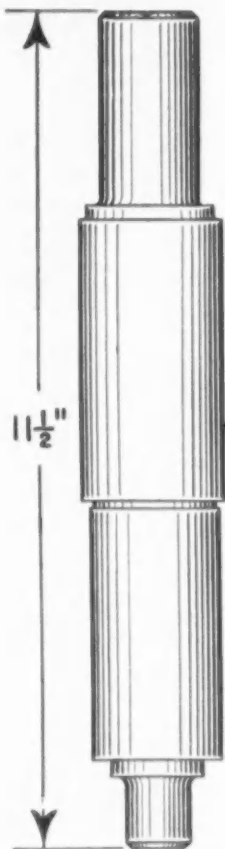
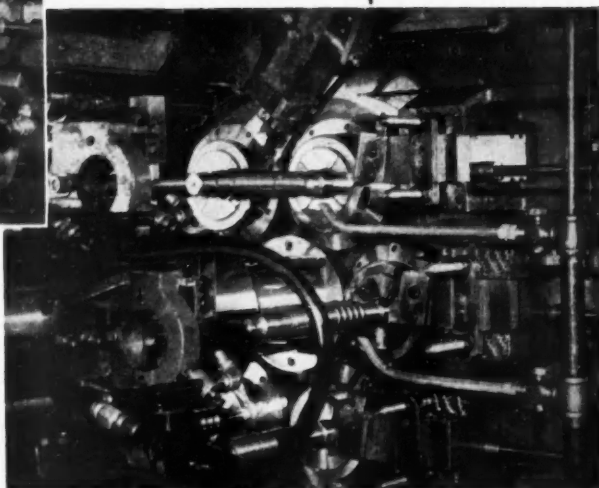


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Front Side Rear Side



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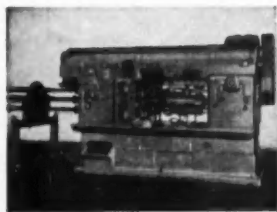
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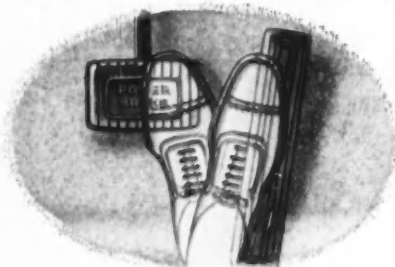
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Result: MORE DRIVING COMFORT, LESS FATIGUE AND GREATER SAFETY.

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Remember, too, this new low pedal power brake is the product of Bendix, world's largest producer of power brakes and leader in braking developments since the earliest days of the industry. That's why if you are contemplating power braking it will pay to "Sign Up" with Bendix for the greatest improvement in braking since four wheel brakes.

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High Spots of This Issue

★ Cold Working of Metals Cuts Waste and Improves Quality

Delco-Remy Div. of General Motors Corp. has transformed the old art of cold working into a fine science to reduce manufacturing costs appreciably. The author reviews its techniques and their applications in parts production. See Page 32.

★ 23rd Annual Swiss Automobile Show

The cream of European motordom was well represented at the recent Geneva Automobile and Truck Show with 425 exhibitors from 13 nations on hand. All of the latest automotive developments to be seen are reviewed in this dramatic report. Page 36.

★ Problems of the Automatic Factory

Like any new development which matures with amazing rapidity, the marked advance of automation has not been without its attendant problems of worker training, maintenance, costs, etc. This article shows how they are being resolved. Page 40.

★ Evolution of the F-86 Sabre Jet Fighter

Nemesis of the Russian MIG, the Sabre Jet is a plane with a colorful history that began in 1944. Since that time many design changes have been incorporated to make it the top-notch aircraft it is today. Its development is traced here. Page 45.

★ How Special Machinery Is Developed

Decisions to install special equipment for improved production are not made overnight or by one individual. Rather, they represent long hours of study by numerous specialists. This approach typifies procedures used at Delco-Remy plants. Page 50.

★ 23 New Product Items And Other High Spots, Such As:

Warner Gear's mechanical power steering system; interest centers on production panels of the ASTE annual meeting; special tests at GM proving ground; Plymouth Hy-Drive transmission; driveshafts for Mack trucks and buses balanced to close tolerances; and **Shorties** (reader interest has prompted the running of this new feature twice a month instead of just once).

Automotive and Aviation News, Page 17
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS—
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT



Meeting Emergency Demands for Steel

Here are records of six emergencies faced—and met—
by Ryerson Steel Service:

Shutdown Averted

4:30 p.m.—1000 lbs. bar stock urgently needed to avert shutdown of night operations. Order processed by office at 4:35; goes to warehouse at 4:41. Steel leaves Ryerson plant at 5:30; arrives at customer's plant (7 miles away) at 6:05 p.m.

Shipped in 1½ hours

10:15 a.m.—two plates needed immediately. With customer still on phone, Service Department alerted. Steel sheared to size and on its way by 11:45 a.m. same morning.

Night Shift Comes Through

3:00 p.m.—order phoned in for 20,000 lbs. of sheet steel. Needed (90 miles away) at 8:00 a.m. next day. Working through the night, Ryerson warehouse crew cuts the steel—loads it on truck that leaves at 6:00 in the morning. Shipment arrives at customer's plant on time.

Breakdown Saturday—Production Monday

Saturday—11:45 a.m. Emergency call. 8" alloy steel round needed to repair breakdown of main shaft. Cut during lunch hour, the 1700-lb. bar is immediately trucked to airport; loaded on cargo plane. Customer meets plane on arrival in distant city. Repairs are completed Sunday; full production resumed on Monday.

Delivery 600 Miles Away—7 Hours

3:00 p.m.—200 lbs. of flat bars, in cut lengths, needed in a hurry 600 miles away. Just 2½ hours after receipt of order, plane takes off with steel from Ryerson. At 10:51 p.m. same day, customer has his steel.

Still Hot When Delivered

11:15 a.m.—Manufacturer reports breakdown; needs 2" x 72" x 10' plate at once—must be flame cut. Plate delivered at 2:15 p.m., still hot.

Of course, out of thousands of orders, we can fill only relatively few at such breakneck speed. However, in emergencies, the world's largest steel service organization, with 15 interconnected plants, is your best source for steel. And, despite some shortages, you can also count on Ryerson for most every day-to-day steel requirement. So when you need steel—carbon, alloy, stainless—call your nearby Ryerson plant.

PRINCIPAL PRODUCTS: CARBON, ALLOY & STAINLESS STEELS—BARS, STRUCTURALS, PLATES, SHEETS, TUBING, MACHINERY & TOOLS, ETC.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 108, No. 8

April 15, 1953

Car Cooler Demand Surprises Cadillac

Cadillac reports interest in its air conditioning unit considerably higher than originally expected. J. M. Roach, general sales manager, says that it is possible that half of the cars delivered in southern areas may be equipped with the air conditioning units. He says further that one distributor in Texas reports a demand of 65 per cent for air conditioning. Nonetheless, response has indicated that demand for air conditioning is likely to be brisk even in northern areas in the price class served by Cadillac. The units are available for any closed car model since a complete new operation for factory installation has been set up. In addition, complete kits of units identical to those installed at the factory are now available for previous models for installation by dealers.

Drive-ins Look Through Tinted Glass Darkly

You just can't please everybody! Owners of drive-in theaters complain that the tinted glass windshield distorts black and white pictures and is even worse for viewing colored movies because they mask out the colors. Another complaint is that they make polaroid glass useless for one type of three dimensional projection. The theater owners are asking the automobile industry to study the problem and develop a type of glass that will overcome the present objections.

F-Head Engine in Jeep

A new model of the civilian Jeep, first major change in this vehicle since 1946, was announced recently by Willys-Overland Motors, Inc. The 72 hp F-head engine used in the military models is now used, raising the hoodline 4 in. and the price \$24.77 to \$1,376.90.



United Press

LIGHT COMBAT TRUCK

This 1500-lb experimental truck is being tested by the armed services. Mid-America Research Corp. built it to Marine specifications, is working on ten more. Only 96 in. long the two-seater is rated to carry 1000 lb cross-country at 50 mph. Prototype had Porsche four-cyl, 79 cu in. aircooled engine of 44 hp; later models will use Lycoming 65 hp engine. Positive four-wheel drive is through No-Spin differential. Wheels have independent cantilever leaf springs, while steering is the pivot center type.

K-F, Dodge Add Models

Kaiser-Frazer soon will announce a "price" series in the Kaiser line. It will be called the Carolina series and will consist of a two-door and a four-door sedan which will be identical mechanically to the Kaiser deluxe. Advertised delivered price of the four-door sedan will be \$2,372, or \$140.10 under the current price of the Kaiser deluxe. The two-door sedan will be \$146.44 lower than the Kaiser deluxe two-door and will carry an advertised delivered price of \$2,312. Most of the modification is achieved through elimination of deluxe features such as the rear cigar lighter and ash tray, door-operated courtesy lights, automatic lights in trunk and glove box, and the chrome horn ring. Some changes in interior upholstery trim also are made, including replacing of welts with French seams. Exterior

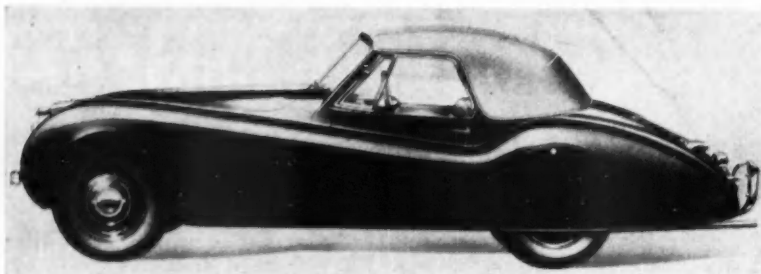
changes include eliminating the gravel shield extensions.

Dodge will add two sixes to its Coronet series which up to now has been powered by the V-8 exclusively. New models are the club coupe and the four-door sedan. They will have the same trim features as the current V-8 Coronet series.

Wire Wheel Problem for Tubeless Tires

The wire wheel fad has created a headache for manufacturers of tubeless tires. Cadillac says that most of the tubeless tires now being sold cannot be used with the company's wire wheels because a satisfactory method of sealing the spoke ends has not been developed. Cadillac also says that tubeless tires cannot be used with its standard wheels equipped with current wheel disks. Tire companies are working on the problem, however.

News of the AUTOMOTIVE



ALL-WEATHER JAGUAR

Introduction of the Jaguar XK-120 Convertible was announced this month. Features include roll-down windows, folding top padded to conceal operating mechanism. Shipping weight is boosted to 2968 lb.

Long-Term Gain Obscure in Sale of Willys

There still remains a great deal to be known about any long-term advantages to Kaiser-Frazer from acquiring physical assets of Willys-Overland Motors, provided Willys stockholders approve next week. Admittedly there are obvious financial advantages on a short term basis.

For the long pull, however, the benefits of the deal, which cannot properly be called a merger, are obscure. Announcements of both companies were extremely vague about future plans so far as integration of manufacturing and dealer facilities are concerned.

Both K-F and Willys made it a point to emphasize that the current organizations would remain pretty much intact with each company's present products being handled by existing dealers and distributors. Willys, in fact, said that manufacture and sale of its products would be continued, all principal officers will be retained for a minimum of two years provided they give satisfactory service, labor contracts will be assumed *in toto* by the purchaser and that distributor franchises will continue in effect.

The deal was made between Kaiser Manufacturing Corp., a wholly-owned K-F subsidiary set up more than two years ago to produce defense products, rather than the parent K-F organization. Reasons for this are not clear, but it possibly may be that it eliminated the need for approval by K-F stockholders, with whom the company has had some difficulties from dissident factions.

A look back raises some questions about the future so far as profitable earnings of both companies over the years ahead are concerned. K-F has lost money three years out of the five it has been operating. Latest indications are that the company may be in the black at present because of its defense operations but still will show red ink for the year.

Willys currently is showing exceptionally high earnings but more than half its business is in defense contracts. One of the principal reasons for its high excess profits taxes is the low earnings during the tax base years preceding the Korean war. Ward M. Canaday, Willys-Overland chairman and president, pointed out the definite advantages enjoyed by large well-capitalized companies with integrated facilities and organizational depth over smaller firms of more limited facilities and narrower capital structures. He added that Willys directors recognize the competitive limitations of smaller companies with limited profit margins per unit and large expenditures necessary for style changes, engineering progress, and heavy advertising.

Power Steering for Hudson

Hudson will offer power steering soon. It will be supplied by General Motors and will be of the non-integral, or linkage booster type. GM has done considerable engineering on this type steering and is tooling for large scale production.

A Bendix power braking system became an option on Mercury models produced after April 8.

New Control Plan to Replace CMP

Practically complete decontrol of materials is going ahead pretty much as originally planned. NPA has issued the primary regulations of the new program, called the Defense Material System, which supplants the present CMP but is much more limited in scope. In essence, it will wipe out all priority and allotment authority for civilian and defense supporting industries, effective July 1, on most materials. Items which are excepted because of critical supplies are nickel-bearing stainless steels and specified alloy steels containing nickel, cobalt and other critical alloying metals.

Strictly defense manufacturers, however, will still have the benefit of priorities and the plan also calls for definite set-asides of copper, aluminum, and steel for military use.

Future Trends Outlined at Show

At the Auto-Lite Easter Parade of Stars automobile show held in New York last week, L. H. Middleton, vice-president and director of engineering, told the press of several new developments in engineering. Discussing the advantages of the six-volt electrical system, he said ignition performance has been improved over 12-volt results, at less cost.

Brake cooling with forced air, a liquid, or sodium was listed as a probable necessity in the near future. Mr. Middleton said that an electro-hydraulic system might well be in use by 1955.

Lighting by sodium or other color-producing means, to reduce glare by the color-interference method, is receiving much attention, he stated. A reduction in the number of spark plug types, and development of plugs for specific engines, is another current project.

The 1954 model year will see three-dimensional curved windshields, compression ratios of at least 9:1 on four engines, and fuel injection, he added. For the future, he said that gas turbine development has advanced to road-testing turbine designs which give fuel economy of 10 mpg at conventional speeds. He added that a turbine-powered automobile might be offered by 1955.

AND AVIATION INDUSTRIES

Production Problems Probed at SAE Panel

Working to the theme "Production Tomorrow," the National Production Meeting of the Society of Automotive Engineers held in Cleveland last month scheduled eight production panels and four technical papers. A great deal of interest was displayed, not only on tomorrow's production but on today's problems, at the discussions which covered quality control, production control, grinding and cutting tools, foundry techniques, forgings, materials handling, preventive maintenance of plant equipment, and assembly methods.

Rating on a quality basis just as firms are rated on a financial basis today was advanced at the quality control panel. The problem of selling top management on quality control was discussed.

A major factor in production control is the sales forecast, according to the majority at that panel.

Problems dealing with machining titanium, the use of new coolants and coolant systems, and fabricating carbides were discussed at the panel on grinding and cutting tools. One of the major themes at the foundry panel was that of attracting workers. Cleaning up the foundries to make them a more desirable place to work was one solution offered.

Heating equipment and forging presses were the main topic of conversation at the forging panel. It was brought out at the materials handling panel that 30 per cent of final product cost is materials handling expense. Collapsible containers and overhead conveyors received much attention at the conference.

Cost was a factor at the preventive maintenance session. Selling management on a program and using sales forecasts as a program basis were widely discussed. Incentive plans and the justifying of expense for special equipment were two items which created much interest at the panel on progressive assembly techniques and methods.

Crosley Motors Merges

Stockholders of Crosley Motors, Inc., have approved merger of the company with Aerojet Engineering

Industry Watches Effect of Price Cuts, Time Sales

Other automobile companies are watching the effect of the Chrysler price cuts, averaging \$100 a car, on their own sales. General Motors rushed into print immediately with a statement that it had no intention to cut prices now and Ford, while not being definite, indicated that it will follow the same course. Packard, Studebaker, Kaiser-Frazer and Willys also say they have no price reductions planned for the immediate future. Nonetheless, Chrysler's action could possibly have an adverse effect on its competitors if the public decides to hold off buying new cars in the ex-

pectation that other companies will follow the Chrysler lead.

While the Chrysler cuts do not touch off a competitive wave of reductions by other companies, it would seem that it is only a matter of time until at least some will be forced to follow suit. With production booming at a rate of approximately seven million cars a year, something is going to have to give along the line in order to keep retail volume moving. On the other hand, cuts cannot be too big in the face of high costs, particularly where conversion and other costly steel is used. One almost certain development is that dealers also will have to bear a part of the cost reduction through reduced margins, over-allowances on used cars and other discounting that will meet prices of their competitors.

Cheering Note

Many automobile sales executives are a bit uneasy about the big upsurge in credit sales of automobiles. Percentage of automobiles sold on the cuff today is the highest in history, estimated variously at from 65 to 75 per cent. Normally, time sales account for about 50 to 55 per cent. Outstanding automobile credit at the end of January was \$5.3 billion, 34 per cent higher than the year previous. It is expected to mount to between \$6 billion and \$7 billion by the end of this year.

However, the latest survey of consumer finances conducted by the Federal Research Board should be cheering news for automobile sales managers. The survey found that more consumers are planning to buy new cars this year than was reported in either 1952 or 1951 findings. The study was conducted by the University of Michigan and has been remarkably accurate in its forecasts in previous years.

A survey by the U. S. Dept. of Commerce recently indicated that every major industry expects a higher sales volume in 1953 than in 1952. Backlog in the automobile manufacturing industry was put at eight months of current sales level. Net sales were said to be expected to increase 18 per cent.

Corp. at Azusa, Calif. Aerojet stockholders previously had approved the merger. General Tire and Rubber Co. has major control of stock in both companies. The new firm will be called the Aerojet-General Corp. The California firm develops and manufactures rocket motors, jet assist take-off equipment for aircraft, and rocket components and propellents, and has plants in Azusa and Sacramento, Calif. Crosley plants are located at Cincinnati and Marion, Indiana. Integration of operations between the two merged companies is under discussion, but plans will be announced later.

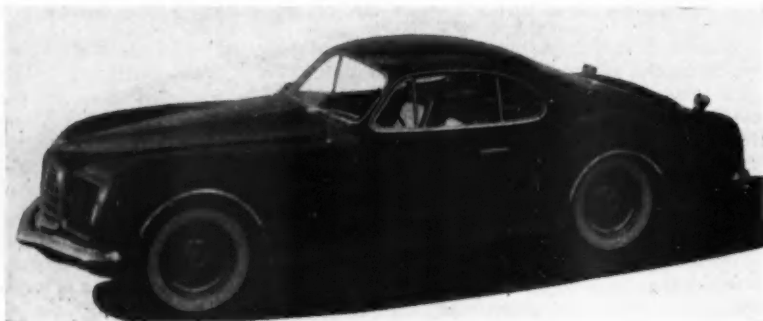
New Twist Test

A new means of measuring crankshaft twist has been developed by two Ford engineers. The device can accurately clock, for any given engine, the one speed at which crankshaft strain is the greatest.

In preparing an engine for testing, a special fan belt pulley is used. The wheel has cut into its face a circle of 240 chrome-plated gear teeth, which become spinning mirrors.

The light beams reflected from the mirrors are picked up by a photo-electric cell and counted. Crankshaft twist sets up a vibration pattern which disturbs the rotation speed of the pulley wheel, and the new device analyzes this speed change. Ford engineers say it provides a greater degree of accuracy than other twist indicators in use in the industry.

News of the AUTOMOTIVE



STYLED BY CHRYSLER

Called D'Elegance, this new design was displayed by Chrysler at the Auto-Lite show this month. Aside from the custom leather interior and appointments, the chassis and body are of conventional construction. A New Yorker frame was modified for 115-in. wheelbase, and fitted with a standard engine with carburetor shortened to fit the lower hood line. Tires are 17x7.60.

UAW-CIO Pushes Plans for Annual Wage Fight

The UAW-CIO is getting serious about its plans to impose guaranteed annual wages on the automobile industry. At its annual convention in late March the union announced it had appointed a special committee to investigate the problem and that automobile companies will be invited a little later to join in the study. The problem will not be brought to a head for some time yet since most major five-year contracts in the industry do not expire for another two years. However, Walter P. Reuther, union president, has predicted that the battle with the industry will be a bitter one and plans are now being made to assemble all possible information on the yearly wage problem.

Also under fire at the convention were the five-year contracts now existing in the industry, with considerable sentiment evident for discontinuance when the present contracts expire. However, it is still too early to tell how much of the talk actually is politically inspired, and it certainly is too soon to write off the five-year contract as definitely out. The union, however, intends to use the threat of cancelling long term agreements as leverage against automobile companies in their demands to reopen present five-year contracts. Current demands call for inclusion of a major portion of wage raises which have accumulated under the cost-of-living increases to be incorporated into the base pay, plus

higher pensions and other economic adjustments. The convention took the stand that unless the industry works out a satisfactory agreement on these question with the union, future contracts will be limited to two years.

Car Safety Belts? Nash Tried Them

Every so often some self-styled expert scolds the automobile industry for not equipping cars with various safety devices as a protective measure in case of accidents. A little known fact is that Nash in 1950 provided a wide web seat belt with a quick release device, with every car equipped with a reclining seat. It was discontinued after a few months, however, because field reports showed that the customers refused to use it.

Willys Increases Workers' Pensions

Willys-Overland Motors has quietly increased pensions for its 13,000 production workers within the framework of its five-year contract. The increase brings Willys pensions into line with those offered by GM by increasing retirement benefits from \$117.50 a month to \$130 a month. The new program went into effect Apr. 1 and provides benefits of \$1.50 per month for each year of service up to 30 years, plus social security. The increase is made possible by increased social security benefits and higher company contributions.

Replacement Parts Price Rise Small

The removal of price controls from replacement parts has resulted in only a slight increase on the average. There has been a lot of price shuffling up and down, but the overall increase is not more than one or two per cent. Under controls some prices had been raised more than necessary to compensate for others that were held to an unprofitable level. Adjustments have put prices of all parts on a realistic level in relation to costs with about one-third the items being cut and two-thirds raised slightly. May or June may see a temporary replacement parts pinch on items furnished by the car companies. Reason is that fantastically high new car production schedules will rob parts from service for a while. However, manufacturers will take care of critical needs and a really serious shortage probably will not be allowed to develop.

Ternstedt to Occupy New GM Flint Plant

Because of defense cutbacks, a large new plant being built by General Motors at Flint, for Buick, will be turned over to the Ternstedt Div. Buick, however, will lease about 500,000 sq ft, or approximately 30 per cent of the plant area for defense operations. Originally it had been planned to use most of the plant for jet engine work. Total floor space of the new plant, which will be completed about July, is more than 1.88 million sq ft. The facility was designed for dual purpose operations and will be used by Ternstedt for producing automobile hardware.

Maremont Purchases Two Cleveland Firms

Maremont Automotive Products, Inc., has purchased Accurate Parts Manufacturing Co. and Replacement Unit Co., both of Cleveland, and will operate them as wholly owned subsidiaries. Accurate Parts makes assemblies and clutch parts and Replacement Unit Co. rebuilds clutch plates and pressure assemblies. The latter company has plants in Cleveland, New York City, Kansas City, Mo., Atlanta, and San Francisco.

AND AVIATION INDUSTRIES

Ford of England Buys Briggs Subsidiary

Ford Motor Co., Ltd., of England, has acquired control of Briggs Motor Body, Ltd., through purchase of Briggs Trust, Ltd., Briggs subsidiary, which controls 60 per cent of the capital stock of the British body firm. Purchase price paid by Ford for the Briggs Trust is \$8,636,562. Under the terms of the agreement Briggs Manufacturing Co. will receive this year's dividend of \$215,000 which normally would be due in June.

Toronto Plant Ready Soon

Ford of Canada expects to produce the first car in its new assembly plant near Toronto about the middle of May. The new plant is nearly completed, and hiring of employees will begin about the middle of this month. At the outset about 1500 persons will be employed, but this will be increased to 2500 by the end of the year and will reach a maximum of 5000 in two years.

Two Processes Shown for Metal Treating

Kaiser-Frazer has made available to the automobile industry new metal cleaning and sealing products which it has developed for car body finishing. Seven car manufacturers are using the product which is called "Chrometeseal" and marketed through the Cook Paint and Varnish Co., Detroit. The process eliminates minute surface pits and imperfections on the solder-metal surfaces of welded body seams, a problem which has been troublesome since the advent of welded one-piece body and rear fender construction.

Improved nickel plating of complicated shapes is claimed for the Kanigen process of General American Transportation Corp. The wholly chemical process is said to give a coating of uniform thickness, with zero porosity, to any shape that can be reached by a liquid. A saving of one-third or more in the amount of nickel used is a main feature. Two plants are under construction to handle expected business.

Kanigen plate, about five to eight per cent phosphorus, has a Vickers hardness of 550-650.

Management Clinic, Turbine Course Offered

The Detroit chapter of the Society for the Advancement of Management will hold its Fifth Annual Management Clinic on May 20th and 21, in the Rackham Memorial Bldg. in Detroit. It will follow the pattern set by previous clinics sponsored by the Chapter, two days of conference-type discussions on current industrial engineering management and personnel relations topics. The aims of the Clinic are towards more effective application of management techniques to present-day problems with the idea of laying prac-

tical plans for the solving of these and future related problems. Fee including luncheons is \$15 for SAM members, \$20 for others.

An intensive two-week course in gas turbines is offered by University of Michigan, June 29-July 10 at Ann Arbor. About 20 topics will be covered in three-hour sessions of theory, problems, and discussion. Fee is \$100 for tuition and a set of notes. Housing is extra and should be arranged directly with Michigan Univ.

New Aircraft Orders

New orders totaling more than \$3.7 million for a variety of products ordered by several aircraft manufacturers were awarded to Ryan Aeronautical Co. The largest is from General Electric Co. for an additional quantity of J47 jet engine parts. New contracts were also received recently for electronic components for guidance systems which Ryan is developing for the USAF.

Northrop Aircraft, Inc., received USAF orders for production of a quantity of guided missiles, bringing the company's backlog to an all-time high of over \$500 million. Missile contracts now on hand call for deliveries through 1955.

Cars Afford Some Shelter Against Atomic Explosion

Passenger cars which were subjected to the fury of the recent atomic explosion at Yucca Flat, Nev., brought forth some rather interesting facts on their merits as shelters in the event of an enemy attack on this country.

Aircraft Tubeless Tire

Firestone, in cooperation with the Navy, has developed a tubeless tire for the main landing wheels of aircraft, and initial flight tests have proved successful. The tire utilizes nylon cord and is 20 per cent lighter than a rayon cord tire and tube assembly. The savings in weight are estimated at from seven to 125 lbs, depending upon the number of tires used on the plane and their size.

Continental Aviation & Engineering Corp. is planning initial production this year of its Palouste turbine engine as a portable compressed air generator for pneumatic starting equipment to be used by the Air Force. The company has received an initial \$5 million contract.

Ionia Mfg. Merges

Ionia Mfg. Co. of Ionia, Mich., and Owosso Mfg. Co. of Owosso, Mich., have received approval of their respective stockholders to merge. The new company will have its headquarters in Ionia and will be called the Mitchell-Bentley Corp. The Ionia plant will expand its automotive body and trim departments soon.

Although radiation prevented immediate close inspection of vehicles near the blast center, it was possible to observe that there were not as many fires as had been expected in cars within a half-mile of point zero. Many of them, however, were turned over and knocked about up to three-quarters of a mile from this point.

Cars with closed windows located 1½ to two miles from the blast suffered dished tops, but no damage to instruments, upholstery, tires, or failures to start were apparent. Cars with windows open at about the same location showed no dished tops.

All in all, it could be concluded that automobiles afford some degree of protection against bodily injury in an atomic explosion, especially if the windows are left open and if the occupants lie on the floor. Radiation, of course, would still be a hazard.

News of the AUTOMOTIVE

ASBE Elects Coppock as 1953 President

Kenneth E. Coppock, assistant chief engineer of Fisher Body Div., has been elected president of the American Society of Body Engineers for 1953. Other officers elected include Gordon J. Lawton, Briggs Manufacturing, vice president; Edmund Wachnicki, Chrysler, secretary; and Vernon F. Groeteka, Fisher Body, treasurer. Trustees are I. Louis Carron, Carron and Co.; Harry G. Garman, Fisher Body; Charles V. Cheriez, Hudson; Edgar C. DeSmet, Willys-Overland; Alfred F. Debicki, Fisher Body; and Floyd G. Kerby, Budd Co.

Dedication of the new national headquarters building of the American Society of Tool Engineers was held on Mar. 16, 1953, fulfilling the goal of the small group of tool engineers who founded the society back in 1932. Construction of the building on the present site at 10700 Puritan Ave., Detroit, was authorized by the board of directors early in 1948. The building was made possible by the financial backing of many members and the bonds have been since retired. The entire property now is owned outright by the society.

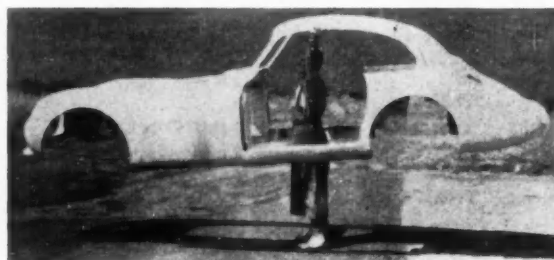
Steel Coating Research

A Wright Air Development Center research contract for developing better high-temperature corrosion and oxidation resistance in low alloy steels has been awarded to Sam Tour & Co., Inc., a New York City technical consulting firm. The project will explore processes for depositing protective surface coatings on steel. The results should ultimately enable industry to reduce the amount of nickel and other critical metals now required in engines and other aircraft components.

The research program will be carried out in two phases. The first phase calls for the compilation of a comprehensive report based on a review of current industrial techniques and an extensive literature search. The second phase will entail laboratory research by the consulting firm on the more promising techniques uncovered during the initial phase.

MAGNESIUM

This body weighs 132 lb as shown. At the Int'l Magnesium Exposition last month it was mounted on an Allard chassis, weighed 395 lb complete. Essex Aero, Ltd., said it can be cost competitive with plastic, also lighter.



Magnesium for Aircraft Uses Featured at Washington Show

Aircraft applications in particular were predominant in the exhibits of magnesium products by the Armed Forces, other Government agencies, and members of the industry at the First International Magnesium Exposition, held recently in Washington, D. C. Sponsored by the Magnesium Association, the displays showed the technical aspects of magnesium fabrication and utilization and demonstrated the wide extent to which magnesium is being used for both civilian and defense purposes.

Uses of the metal in plane airframes and engines were to be noted in displays of an R-4360 Wasp Major engine by Aluminum Co. of America, a Douglas Skyrocket plane, with external fuselage covering of formed magnesium sheets and landing wheels of cast magnesium, magnesium wings for a Navy F9F2 fighter, wing panel and cowl panel for a B-36 bomber, tail cone and turret enclosure by Brooks & Perkins for the B-47 bomber, and various parts for the Allison turboprop, Westinghouse J34 turbojet, and General Electric J47 turbojet engines.

The ground transportation industries came in for their share of attention with an all-magnesium car body mounted on a British-made Allard chassis by Essex Aero, Ltd., an all-magnesium trailer body by White Metal Rolling & Stamping Corp., and the Cummins Diesel Special, Indianapolis Race contender, with magnesium in the cylinder block cover, water pump housing, compressor casing, lube oil tank, etc. It is interesting to note in passing that automotive applications accounted for 7.6 per cent of magnesium output in 1952, while aircraft uses took a sizable 29.3 per cent.

In the large booth set up by Eclipse-Pioneer Div. of Bendix Aviation Corp. aircraft products were also in the limelight with a fuel metering system, B-36 propeller housing, air inlet fairing, jet engine diffuser, transmission housing, combustion chamber inlet, etc. A short distance away the Wellman Bronze & Aluminum Co. booth featured various parts for the Sikorsky S-55 helicopter and a number of castings for use in aircraft, automobiles, tools, trucks, and buses. Across the aisle a huge booth erected by Dow Chemical Co. contained, in addition to graphic illus-

1953 MOTOR VEHICLE FACTORY SALES*

	Passenger Cars	Trucks	Buses	1953 Totals	1952 Totals
January	453,319	111,564	54	565,137	375,410
February	488,071	96,729	190	585,090	435,216
Total—Two Months	939,390	208,293	444	1,148,127	810,626

1953 MOTOR TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	53,077	21,481	4,067	16,349	3,934	8,786	3,870	111,564
February	45,121	18,279	3,413	13,349	4,243	8,249	4,075	96,729
Total—2 Mos. 1953	98,198	39,760	7,500	29,698	8,177	17,015	7,945	208,293
Total—2 Mos. 1952	70,693	35,946	12,165	45,667	11,517	16,308	8,661	202,877

*—Automobile Manufacturers Association.

AND AVIATION INDUSTRIES

trations of magnesium production, models of a Lake Erie 1000-ton die casting machine being installed in its Midland, Mich. plant, an 84-in. cold finishing mill, and the equipment used to extract magnesium from sea water. A host of products incorporating magnesium, such as power saws, trailer wheels, sheet, extrusions, castings and forgings for aircraft, were also on display.

One of the most interesting exhibits in the Brooks & Perkins booth was a magnesium research missile designed for the N.A.C.A. Surrounding it were other numerous items of magnesium, such as antenna reflectors for Grumman fighters, radar equipment, rocket shipping case, stretch-formed jet pod for Bell Aircraft, and bomber de-icer and gun turrets.

Wyman-Gordon Co. displayed an extensive array of magnesium forgings for various uses, while Janitrol Aircraft-Automotive Div. of Surface Combustion Corp. had its Heatpak portable ground heater for aircraft with magnesium used in the framing and casing. Heli-Coil Corp. was on hand with its line of screw thread inserts, and General Magnesium Foundries, Rolle Manufacturing Co., American Light Alloys, and Hingham

Foundry showed their lines of castings.

In the materials handling field, Magnesium Co. of America and Magline, Inc., featured their dock boards. The latter also showed a new magnesium hand truck. Other items of rather unusual interest were the Fairchild XC-120 roadable cargo pack and a collapsible boat trailer.

Hall-Scott Engine Has Higher Compression

A new high-powered engine for trucks and industrial uses, Model 1091, has been put into production by Hall-Scott Motor Div. of ACF-Brill Motors Co. The six-cyl engine can be supplied to run on either gasoline or butane. It can be converted from one fuel to the other with only slight modifications.

With a bore of 5- $\frac{3}{4}$ in. and seven in. stroke, displacement is 1091 cu. in. Dry weight of the bare engine is 2150 lb; accessories weight 150 lb. Overall length is 62- $\frac{3}{4}$ in.; height, 47- $\frac{3}{4}$ in.; and width, 30- $\frac{1}{2}$ in. The cylinders are cast in block, made of chrome, nickel, and molybdenum cast iron. The 1091 has seven main bearings, and is water-cooled.

New Driver Training and Safety Movie

A new training and safety film for industrial truck operators has been produced by the Clark Equipment Co. The new 30 minute sound movie, titled "Safety Saves," was filmed at on-the-job factory and warehouse locations. It dramatically illustrates the "do's and don'ts" of safe driving, and shows the cause of most truck accidents and how to avoid them. For truck owners who want to reduce accidents and cut damage-to-goods, the new movie will be a valuable training tool. It is believed to be the only training film of its kind in existence.

Pesco Supercharger Sold

Pesco Products Div. of Borg-Warner Corp. has sold its supercharger business to Dexter Folder Co., Pearl River, N. Y. The deal included all manufacturing, sales, engineering and service facilities. Space freed by disposal of the supercharger business will be utilized for manufacture of hydraulic equipment. Dexter will set up a new division to be known as Miehe-Dexter Supercharger Division, Racine, Wis., and its products will be manufactured by Christensen Machine Co., a wholly-owned subsidiary.

87 New Standards

The American Standards Association, Inc., approved 87 standards in 1952, according to the annual report issued last month by the managing director. The increase brought the total American Standards in effect to 1264.

Newly-approved standards of particular interest to the automotive industry included: Round head bolts, B18.5-1952; square and hexagon bolts and nuts, B18.2-1952; accuracy of engine and tool room lathes, B5.16-1952; specifications for carbon- and alloy-steel nuts for bolts for high pressure and high-temperature service, G38.1-1952; acme screw threads, B1.5-1952; stub acme screw threads, B1.8-1952; mounting dimensions of lubricating and coolant pumps for machine tools, B5.28-1952; and preferred thicknesses for uncoated thin flat metals (under 0.250 in.), B32.1-1952.

1953 U. S. PASSENGER CAR PRODUCTION

(As reported by the car factories)

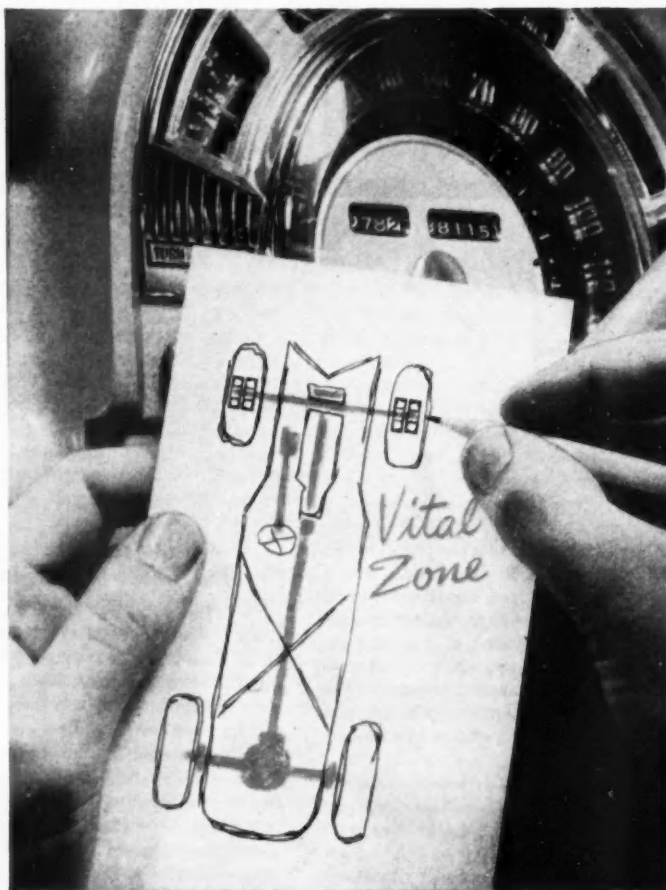
	March 1953	February 1953	March 1952	Three Months	
	1953	1952	1952	1953	1952
Chrysler.....	17,029	16,624	10,568	50,337	31,923
De Soto.....	13,506	10,761	8,238	34,069	24,326
Dodge.....	28,534	30,325	18,920	90,122	61,692
Plymouth.....	58,276	52,614	38,906	160,735	111,679
Total—Chrysler Group.....	117,347	110,324	76,532	335,253	229,420
Ford.....	91,699	78,195	78,667	248,943	154,764
Lincoln.....	4,971	801	3,412	9,655	6,634
Mercury.....	23,639	18,623	16,742	62,704	38,134
Total—Ford Group.....	120,309	95,619	100,821	319,302	199,732
Buick.....	45,955	39,757	28,440	123,903	76,936
Cadillac.....	11,082	9,939	7,370	30,312	20,378
Chevrolet.....	134,636	114,574	72,390	350,547	210,200
Oldsmobile.....	32,228	27,045	18,803	86,553	64,259
Pontiac.....	38,237	31,367	22,303	100,263	64,697
Total—G. M. Group.....	262,118	222,682	147,306	691,598	426,470
Kaiser-Frazer Group.....	4,652	4,057	5,440	11,748	14,819
Hudson.....	10,243	8,499	8,732	25,045	22,561
Nash.....	19,050	19,830	12,550	53,981	18,346
Packard.....	9,937	10,053	5,994	30,874	15,444
Studebaker.....	19,633	10,923	13,926	35,993	47,542
Willis.....	5,708	4,401	5,700	16,759	13,470
Total—All Makes.....	566,997	465,198	376,301	1,519,913	987,838

The appeal that wins by a mile— mile after mile

YOU can sell some car buyers by talking about style. Others with automatic features or horsepower.

But there's one appeal that's miles ahead with *everyone*. And that's appreciated more mile after mile. It's *value*. And especially where value counts most—in the "vital zone"—the moving parts of the car.

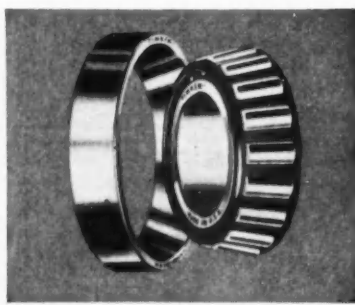
Timken® bearings give you far more value than any other tapered roller bearing because of higher quality, better service, wider public acceptance. In terms of the value you get, Timken bearing prices are lower today than ever before. The Timken Roller Bearing Company, Canton 6, Ohio.



How TIMKEN® bearings give you value where it counts most . . . in the "vital zone":



HARD OUTSIDE—TOUGH INSIDE. Cups, cones, and rollers of Timken bearings are made from Timken alloy steel, then case-carburized in furnaces like these to give a tough, shock-resistant core and hard, wear-resistant surface. It's one reason for the long life of Timken bearings.



PINION-PROVED. On the pinion—toughest bearing application in the car—Timken bearings are standard on all but two makes of cars. Throughout the "vital zone"—in pinions, wheels, differential transmissions, steering gears—Timken bearings give top value.

ONLY TIMKEN BEARINGS GIVE YOU ALL THESE VALUE FEATURES

QUALITY

1. Design leadership
2. Steel made in our own mill
3. Precision manufacture
4. Rigid quality control
5. More than 50 years' experience

SERVICE

6. Unequalled engineering service
7. Unequalled research and development facilities for your use
8. Installation service in the field
9. Widest range of sizes
10. Most dependable source of supply

PUBLIC ACCEPTANCE

11. First choice throughout industry
12. Best-known name in bearings
13. Widespread advertising

it's TIMKEN for VALUE

TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER □ THE TIMKEN TAPERED ROLLER □ BEARING TAKES RADIAL ○ AND THRUST → □ LOADS OR ANY COMBINATION → □

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers



Federal-Mogul Corp.—James C. Morrison succeeds P. J. Potter as manager of the Detroit plant.



Borg-Warner Corp.—Appointment of Albert Steg as controller was announced last month.



Ohio Crankshaft Co.—Chester H. Kimmel, vice-president, was appointed general manager.

Brenholts, Goin & Ogg, Inc.—David A. Coulter has been elected a director.

Garrett Corp.—John K. Northrop has been retained as consultant to the president.

Northrop Aircraft, Inc.—Dr. William F. Ballhaus was raised to chief engineer, and F. A. Ford is assistant chief engineer in charge of analytical activities.

Boeing Airplane Co.—P. N. Jansen has been appointed special assistant to the senior vice-president.

Detrex Corp.—Robert H. Allgood is now director of public relations.

Oliver Corp.—O. E. Eggen, vice-president, has resigned after 25 years' service.

Studebaker Corp. of Canada—Gordon Grundy has been appointed vice-president.

Willys-Overland Export Corp.—R. M. Chitwood has been named manager of the plant division which includes overseas operations.



Glenn L. Martin Co.—William B. Bergen was named vice-president, operations. He is succeeded as vice-president-chief engineer by E. G. Uhl.

Cleveland Diesel Engine Div.—H. W. Barth has joined the division as chief engineer. Other appointments include Harry Heinzen, assistant chief engineer, electrical; Eric Brater, assistant chief engineer, mechanical.

Fairchild Engine and Airplane Corp., Guided Missiles Div.—Francis J. Gaffney has joined as director of engineering.

Miller Motor Co.—H. Bruce Rasmussen has become sales manager.

Cross Co.—William P. Gallant joins the company as director of human relations.

Nash Motors Div.—Paul McKeown has been appointed national used car manager.

Westinghouse Electric Corp., Aviation Gas Turbine Div.—R. L. Wells is now assistant manager of engineering and P. G. DeHuff is manager of engine design.

Bell Aircraft Corp.—Lt. Gen. William E. Kepner, (Ret.) has joined the firm and was elected executive vice-president.

Packard Motor Car Co.—Roger E. Bremer succeeds Russell R. Rees, who is retiring, as director of purchases. Oliver E. Rodgers has been appointed chief engineer of the Jet Engine Div.



Greenlee Bros. & Co.—Joel A. Jannenga succeeds Judson H. Mansfield, retiring after 47 years with the firm, as chief engineer.

Detroit Harvester Co.—Frank C. Wade is now sales manager of the Motor State Products and Dura Co. divisions.

Necrology

William C. Culp, 54, director of purchases at Autocar Co., died Mar. 17 at Bryn Mawr, Pa.

Flavius E. Loudy, 61, Navy chief aeronautical engineer at Grumman Aircraft Engineering Corp., died at Mineola, L. I., on Mar. 20.

Leggett Brown, 41, assistant to the director of public relations at Ford Motor Co., died Mar. 22 at Ft. Lauderdale, Fla.

Clinton H. Havill, 60, research engineer with Curtiss-Wright Corp., died at E. Orange, N. J., on Mar. 25.

J. Gordon Turnbull, 62, designer and builder of many automobile and aircraft plants, died Apr. 1 at Los Angeles, Calif.

Charles B. Bohn, 73, founder and chairman of Bohn Aluminum and Brass Corp., died Apr. 2 at Miami, Fla.

George N. Sieger, president of S-M-S Corp. of Detroit, died in Indianapolis, Ind., on April 1.

(Advertisement)

AMERICAN CHEMICAL PAINT COMPANY

AMBLER  PENNA.

Technical Service Data Sheet

Subject: HOW **GRANODIZING** PROTECTS STEEL DRUM SURFACES FROM RUST AND IMPROVES PAINT ADHESION

NEW DEVELOPMENT IN CONTAINER INDUSTRY

United States Steel Products Division, United States Steel Company is now producing grease-free, scale-free, rust-inhibited steel drums. A chemically clean metal surface plus a "Granodine"* non-metallic zinc phosphate coating insures maximum finish durability and underpaint rust-resistance. *Trade Mark Reg. U.S. Pat. Off.



ORDINARY PAINTED DRUM after a year of exposure to weather is badly rusted. Rust was very apparent after only one week.

U. S. S. RUST-INHIBITED DRUM of similar type shows absolutely no rust after same year's test.

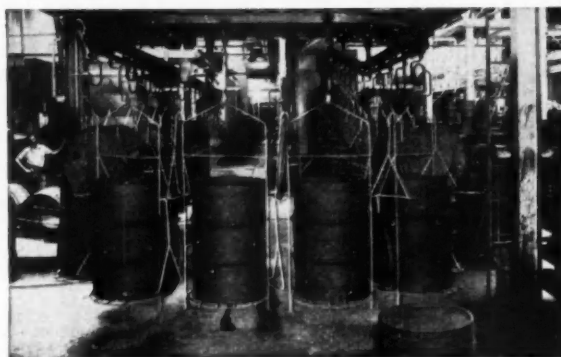
THE PROTECTIVE CHEMICAL TREATMENTS

The Granodizing process embodies the following steps:

1. Grease and dirt removal
2. Full scale removal, after welding the side seam
3. Zinc phosphate coating with "Granodine"
4. Acidulated rinsing in "Deoxylyte" solution



WRITE FOR INFORMATION ON "GRANODINE"
AND ON YOUR OWN METAL PROTECTION PROBLEMS



Port Arthur, Texas, Cleaning Line

U. S. S. drums about to enter the 400 foot cleaning and treating line. Powerful impingement sprays directed at the fabricated shell, head, and bottom, insure that the entire interior and exterior of the drum will receive full cleaning and rust-inhibiting treatment.

ADVANTAGES OF GRANODIZED STEEL DRUMS

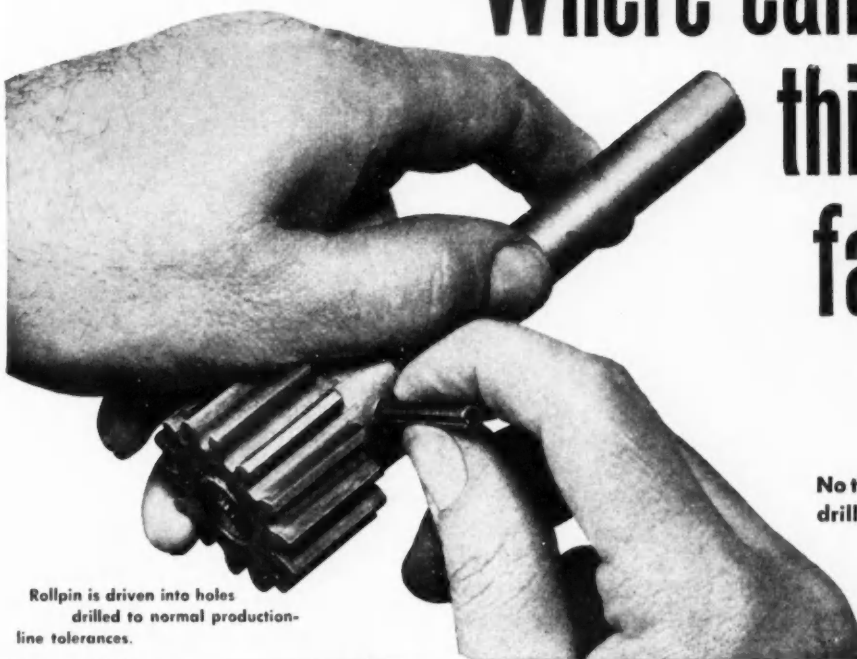
These new phosphate-coated steel drums exhibit many advantages for companies using these containers.

They are chemically clean, "water-break free" inside, free of contaminating residues such as grease, oil, drawing and stamping compounds. When the familiar handkerchief test is applied to United States Steel Products' containers processed by their new finishing technique, no contamination of any kind is left on the cloth.

They are free of mill-scale. United States Steel Products is the first steel drum manufacturer to remove harmful mill scale completely ahead of the zinc phosphate coating stage.

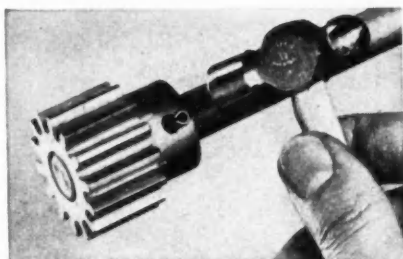
They are rust-inhibited with a zinc phosphate-coating. These new steel drums have the added advantage of a non-metallic, paint-bonding "Granodine" zinc phosphate coating. This has been standard practice for many years in the automotive and appliance industries for long-lasting paint protection and metal preservation.

Where can you use this simple fastener?

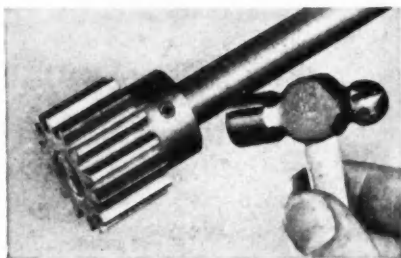


Rollpin is driven into holes drilled to normal production-line tolerances.

No threading, peening or precision drilling with ROLLPIN



It compresses as driven.



Rollpin fits flush . . . is vibration-proof.

Rollpin is the slotted tubular steel pin with chamfered ends that is cutting production and maintenance costs in every class of industry.

This modern fastener drives easily into standard holes, compressing as driven. Its spring action locks it in place—regardless of impact loading, stress reversals or severe vibration. Rollpin is readily removable and can be re-used in the same hole.

* * *

If you use locating dowels, hinge pins, rivets, set screws—or straight, knurled, tapered or cotter type pins—Rollpin can cut your costs. Mail our coupon for design information.



Elastic Stop Nut Corporation of America

Dept. R16-45, 2330 Vauxhall Road, Union, N. J.

Please send me the following free fastening information:

☐ Rollpin bulletin

☐ Elastic Stop Nut bulletin

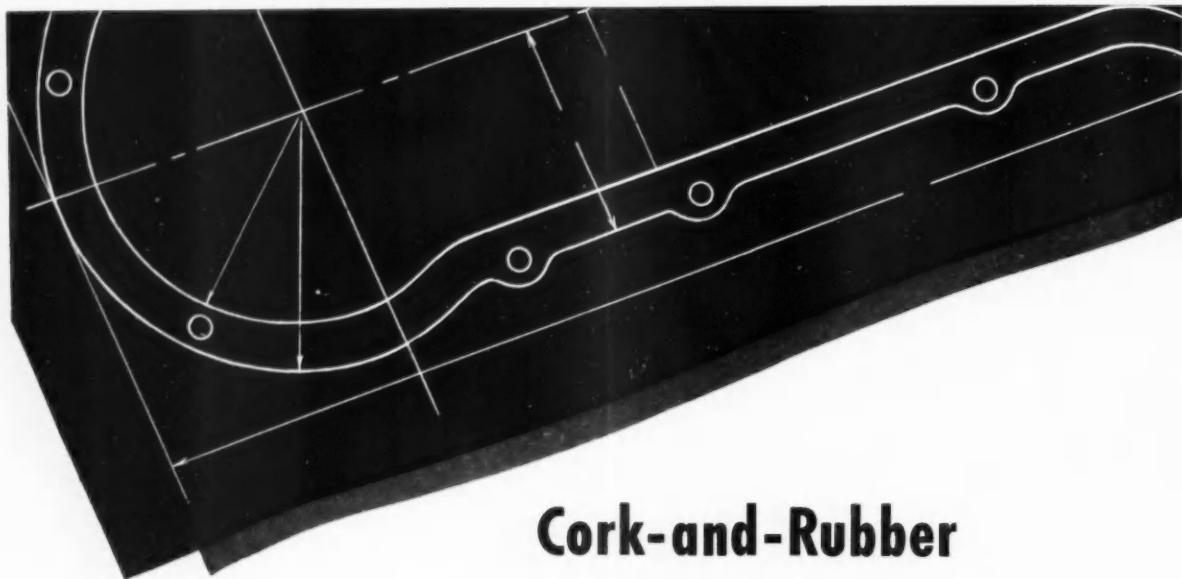
☐ Here is a drawing of our product. What fastener would you suggest?

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____



Cork-and-Rubber Gasket Materials

made to meet government specifications

- **Most complete selection.** For both military and civilian requirements, Armstrong offers gasket users the widest possible selection of cork-and-rubber materials . . . backed by the complete facilities of an experienced, nation-wide organization.

- **New cork-and-rubber compounds.** Armstrong is ready to develop cork-and-rubber materials to meet new volume military requirements as they arise. Please discuss your needs with your nearest Armstrong representative . . . or write us.

- **Synthetic rubber compounds.** Armstrong makes special synthetic rubber compounds for certain highly critical applications. If you need an out-of-the-ordinary rubber compound, get in touch with us.

**ARMSTRONG'S
GASKET
MATERIALS**

Armstrong supplies a cork-and-rubber compound to meet each of the 8 types included in the principal government specifications covering these materials.

Here's a list of these compounds:

Specification	Material	Specification	Material
MIL-G-6183			
Type I Soft	NC-709	Type II Soft	DC-167
Type I Medium	NC-710	Type II Medium	DC-100
Type I Firm	NC-711	Type II Firm	DC-113
MIL-T-6841	{ DK-153 RK-304S	MIL-G-6747	DK-149

For samples and additional information, call your nearest Armstrong office or see "Armstrong's Gasket Materials" in Sweet's file for product designers.

This 24-page manual gives you information on current government specifications and tentative SAE-ASTM specifications, as well as much helpful information on the design and use of gaskets.

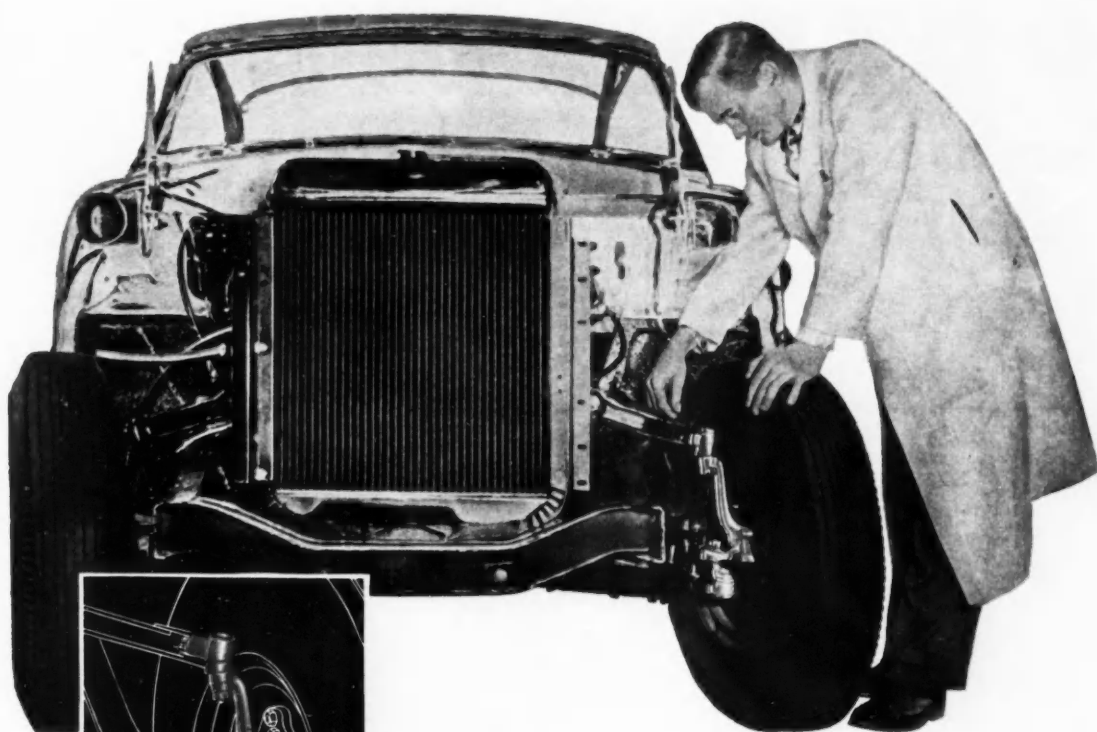


Send for this gasket manual

"Armstrong's Gasket Materials" includes sections on designing gaskets to reduce costs, practical tolerances for resilient gaskets, designing flanges for efficient sealing . . . and many others.

To get a personal copy of this helpful book for your files, write Armstrong Cork Company, Industrial Division, 1504 Arch Street, Lancaster, Pennsylvania.





Easy and uniform steering with Thompson's Front Suspension Ball Joint

BENEFITS OF BALL JOINT SUSPENSION:

1. More space under the hood for wider engines
2. Eliminates front suspension bind.
3. Gives better steering and handling
4. Increases service life many times
5. Greatly reduces front end overhaul time
6. Reduces lubrication points from 12 to 4 per car
7. Cuts assembly time—on production line or garage
8. Eliminates removing front wheels, bushings, draining brakes and realigning wheels when servicing front end

"Easy Steering" comes next to safety in the design of steering mechanism for modern cars. The advance designs—high road speed—increased loads on suspension and linkage—reduced space due to front wheel brakes—increased movement of front wheels—air cushion tires—all increase steering problems. "Easy Steering" is so important to motorists today that they demand it—even if they have to pay extra.

Thompson's Front Suspension Ball Joint gives that easy steering with safety. It gives easy ride and stability at high speed.

In a recent survey of owners of cars equipped with front suspension ball joint, it was found to be the best liked mechanical feature.

We invite you to investigate this most advanced improvement in front end suspension in 20 years. Write, wire or phone Thompson Products, Inc., Detroit Division, 7881 Conant Ave., Detroit 11, Michigan.

You can count on
**Thompson
Products**
DETROIT DIVISION

Manufacturers of Automotive, Aircraft and Industrial Parts

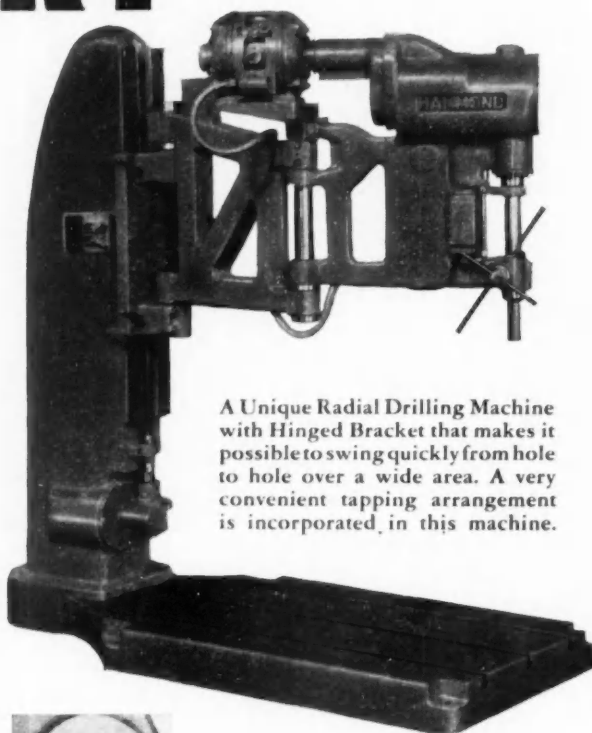
FOOTBURT

machine
tools
for
increased
production

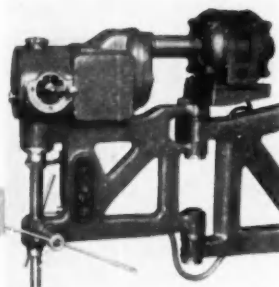
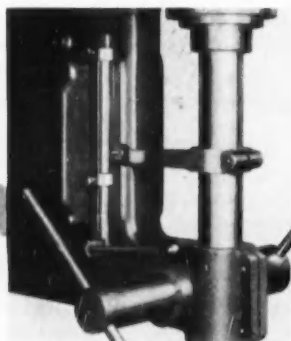
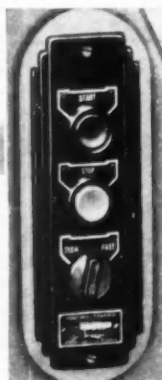
engineered for production

Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio
Detroit Office: General Motors Building

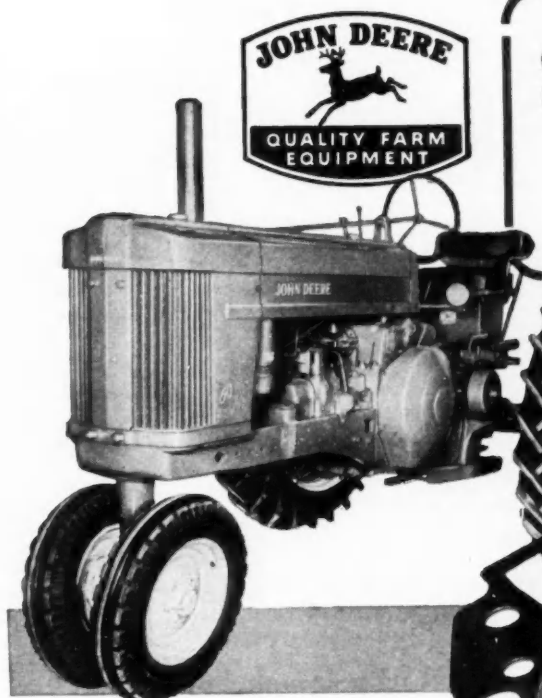


A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.



FOOTBURT

machine tools



SEALED TO ORDER BY VICTOR



MODEL "60" SERIES ENGINE FEATURES **VIC-2-FOLD** SEALING

To the John Deere technical staff, the merits of VIC-2-FOLD cylinder head sealing were readily apparent. Here is the modern development of metal-asbestos gasket structure. The best characteristics of copper, steel, and asbestos are fully utilized. VIC-2-FOLD can be made as thin as needed, yet with adequate compressibility for positive sealing. Strength and durability are increased by this Victor construction.

Sealed by Victor Means Satisfaction

Take a close look at VIC-2-FOLD design, at right, as did John Deere engineers. Here, or in the complete Victor line may be a far better value in automotive sealing products than you're now getting. Your inquiry invited; no obligation.

VIC-2-FOLD

... THE MODERN METAL-ASBESTOS CYLINDER HEAD GASKET

Note how the high strength of steel is utilized in the bottom layer. Combustion openings are turned up, overlapping top copper layer, giving strong protection against breakdown and blowout.

In coolant openings, copper top layer is formed down, utilizing copper's higher resistance to corrosion in contact with coolants and anti-freeze solutions.

Compressibility of VIC-2-FOLD gaskets is precisely controlled by the use of finest long fiber asbestos mill-board, milled in Victor's own plant.

Where can we help you get better sealing?



Victor Manufacturing & Gasket Co., and its affiliate, Victor Sealing Products Co., Inc., P. O. Box 1333, Chicago 90, Ill.

VICTOR

"ORIGINAL EQUIPMENT"

Gaskets and Oil Seals

SEALING PRODUCTS EXCLUSIVELY

Cold Working of Metals

***Reduces Waste
and
Improves Quality***



Fig. 1—Major steps in making tubular generator shafts at D-R are seen here, starting with the Etna tube mill product at the extreme left. The one at extreme right is the screw machine shaft as produced up to now.

By Joseph Geschelin

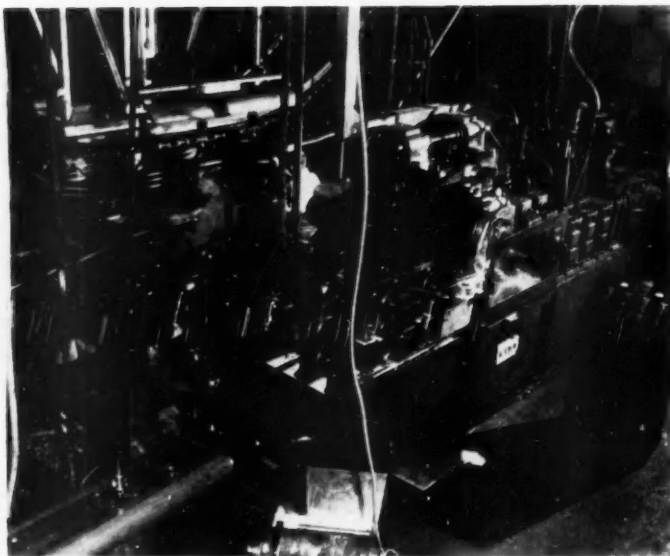
TEAMWORK on the part of many process engineers at the Delco-Remy Div., General Motors Corp., Anderson, Ind., in close cooperation with the product engineering department has evolved some unique techniques in the cold working of steel, copper, and special alloys, stemming from many years of experimental work. The material in this article is based upon the writer's observation as well as a special report on cold working prepared by the Process Department of the Division.

Cold working is an old art which may be defined as a general term for operations which produce changes in the formation of a piece of work by drawing, bending, press-forging, extrusion, or rolling at a temperature below the recrystallization point of a particular kind of metal.

Following many years of development, Delco-Remy reduced to practice on a mass production scale, together with suitable automation, cold working techniques on parts of relatively large size, and on products which require precision control of both size and form. For some time Delco-Remy has been in full scale production on specific steel parts, such as pole shoes, generator shafts, and generator frames required for its normal line of automotive

electrical equipment. The same principles also have been applied to the high speed production of copper commutator bars, not only reducing costs materially

Fig. 2—Here is a view of the Etna automatic tube mill for preparing generator shaft tubing from strip stock fed in from the extreme right. In the center may be seen the seam welding head; at the left are straightening rolls and cut off.



but making a major saving in critical materials.

In general, Delco-Remy process engineers have been able to demonstrate that cold-working not only is a fast, efficient, and economical method of manufacturing but also produces parts having superior physical properties. Tangible advantages may be listed as follows:

1. The process reduces waste, making possible material savings of 50 per cent or more on certain applications.
2. It involves only standard presses and tools, thus eliminating the need for expensive special tools and lowering appreciably original costs of tooling.
3. It improves quality of product, for it lends itself to producing parts in quantity more accurately and uniformly than by machining methods.
4. Increases physical strength when proper flow is maintained.

It is an interesting fact that at least 50 per cent of the final cost of Delco-Remy products is represented by materials cost. Consequently, its engineers and designers have become increasingly materials conscious and have turned to cold working as a sound answer. Actual production experience has demonstrated that the uniformity and accuracy of parts made by this process have resulted in an improvement in the product as well as in lowered costs.

Perhaps one of the most significant things about this whole development is the fact that only small standard presses are required to handle the job for the most part. Only the generator frame requires larger presses and these are by no means large presses as automotive practice goes.

Generator Shafts

Generator shafts, ordinarily made from bar stock and entailing considerable machining and machine tool equipment, now are produced in large quantities by fabrication and cold extrusion. Savings in material run about 62 per cent as compared with the conventional screw machine methods, resulting in a saving of about six tons of steel daily.

As illustrated, Fig. 2, the process starts with strip steel stock of proper width which is put through an Etna tube mill for rolling into tubular form. Near the end station of this machine the joint is seam-welded, using a resistance welding station and roll. The tubing is straightened before it leaves the machine and cut to length.

Tubing sections then are centerless ground on the OD and proceed through a Blakeslee washing machine for chemical cleaning. The last stage of this machine sprays the work with a solution of tri-sodium-phosphate which serves as the lubricant for extrusion operations. The various stages of the succeeding operations are shown in Fig. 1. The part at the extreme right in this illustration shows the solid shaft in previous production, for comparison.

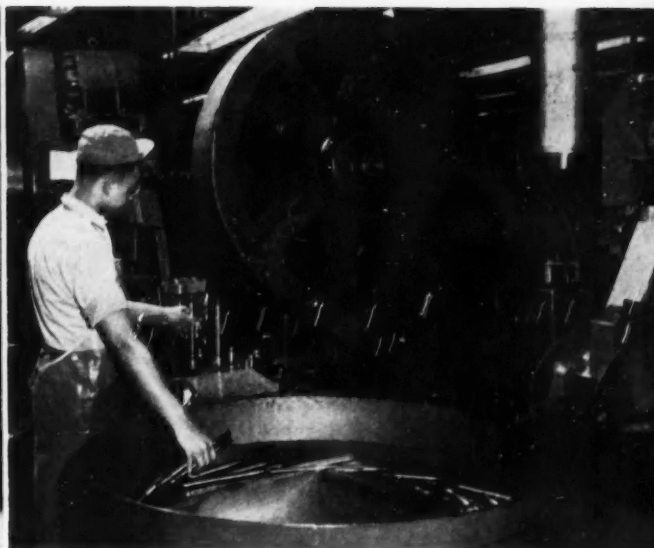
Shafts now are ready for extrusion and finishing operations. The tubing is loaded into a dial feed mechanism, shown in Fig. 3, and transferred automatically to the press at the right of the picture in the rear. Here the work is presented to the extrusion dies on an indexing table, the operation requiring steps at four different die stations. As the shafts leave the press they are transferred automatically into a special Motch & Merryweather machine for machining the extruded end.

(Continued on next page)

Fig. 3—Extrusion of the commutator end of the generator shaft is done in this set-up with suitable automation. Shafts are loaded vertically in the transfer fixtures seen at the left, then presented to the small press on the right while indexed on the rotary table.



Fig. 4—This extremely simple set-up is employed for piercing a keyway in the end of the generator shaft. This fast and relatively inexpensive operation supersedes the former method of keyway milling which was customary.



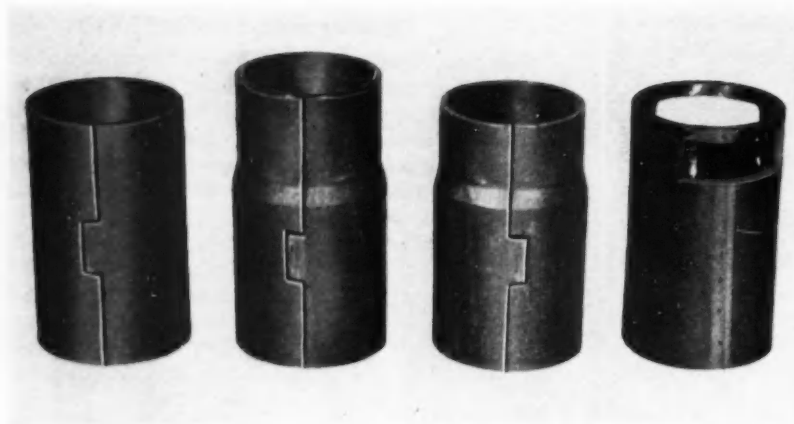


Fig. 1A—Here are the basic steps in the cold-forming of generator frames. Roll-up of strip stock into cylindrical form with a lap joint is as seen at the left. Major extrusion of one end is shown next. The frame at right represents former practice.

The foregoing operation takes one end of the shaft and similar operations then are repeated on the opposite end in a similar battery of machines. Next the shafts proceed to an adjoining machine where the keyway in one end is produced by a simple piercing operation which takes the place of the former keyway milling method. Note Fig. 4.

Final major operations include: centerless grinding of bearings at both ends in a conveyORIZED line of Cincinnati Centerless grinders; rolling the threaded end in a Reed thread rolling machine; and rolling splines at two elements along the length for holding laminations.

Fig. 2-A—First operation on the frame is done in the 700-ton Bliss press shown here. Low carbon plate strip is fed into the press on the table in the foreground. The material proceeds through a multiple-die station where it is blanked to form the lock joint, cut to length, and rolled into cylindrical form.



Generator Frames

By far the largest part to be handled by cold forming at Delco-Remy is the generator frame. This project was handled in close cooperation with design engineering to combine desirable design characteristics with an economical manufacturing procedure. Fig. 1-A illustrates the basic steps involved. Incidentally, the frame at the extreme right is the former conventional design made by rolling and welding of the joint.

In the new process, material in the form of low carbon plate steel of proper width is fed to a 700-ton Bliss press. Note Fig. 2-A. Here it proceeds through

Fig. 3-A—Extrusion of one end—the second stage—is handled in this 390-ton mechanical press. For this operation the work is given a chemical wash, a chemical coating, and a dip in a soap-base lubricant.

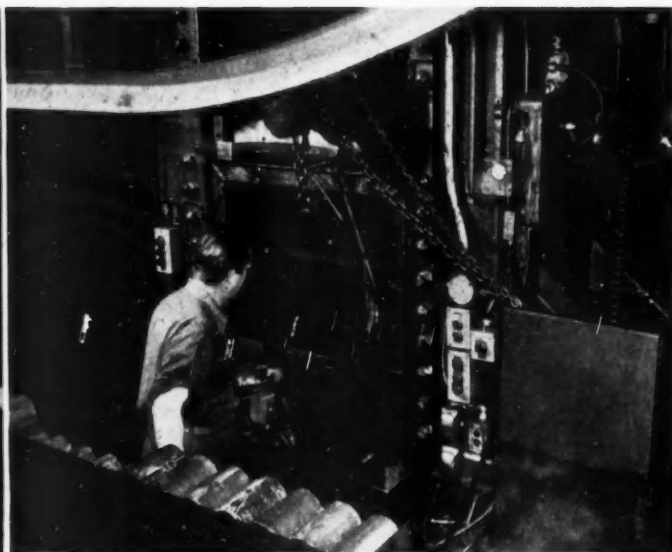
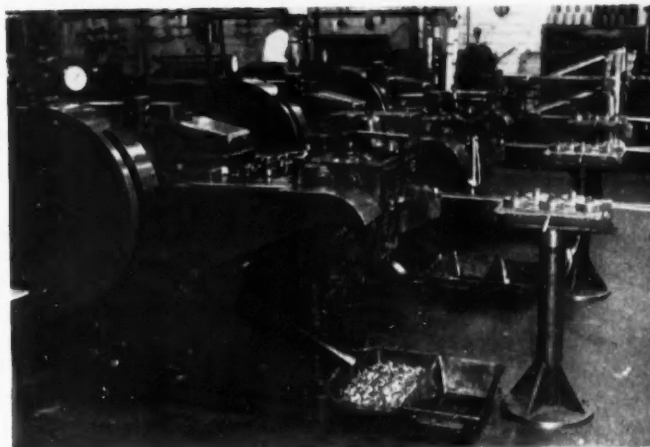


Fig. 5—Commutator bars, as produced by the new technique, are formed in these National Machine two-blow cold headers. Examination of the one in the foreground will show clearly the feeding of two formed strips at a time through the straightening rolls at the right.

a multiple die station—blanking to form the lap joint, cutting to length, and rolling to the cylindrical formation at the extreme left. It may be noted that the lap joint is employed not to impart joint strength but to provide the location for the large drilled and countersunk hole at this point without discontinuity. During the rolling operation there is sufficient plastic flow to make the joint secure without resorting to the usual welding operation.

The next phase is extrusion of one end as shown in the second stage in Fig. 2-A. This is done in vertical position in a die in a 390-ton mechanical press, producing the extended neck section, the common inside diameter of the frame being held closely by means of a suitable ram or mandrel. Note Fig. 3-A. Before extruding, however, the work goes through a washing machine and is given a lubricant coating. This chemical coating, together with a soap-base lubricant, provides the necessary lubrication that makes extrusion a successful process.

From extrusion the frames proceed to a group of two-station special machines. In the first station the necked end is cut to length, as seen in stage three of Fig. 1-A. The part is then transferred by automation into the second station of the special machine where

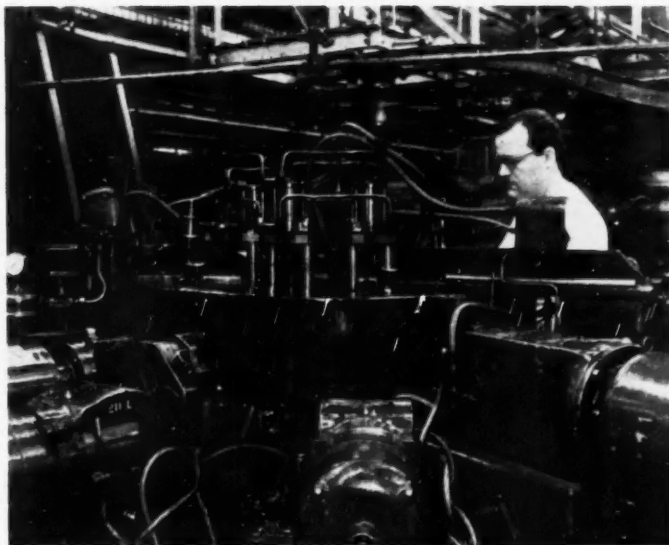


the necked end is suitably turned and chamfered.

Piercing as well as drilling of a number of small holes in the end face of the necked end is done in an ingenious multiple-purpose machine, consisting of a small Federal punch press for piercing and a cluster of Ex-Cell-O precision drilling heads for drilling end holes. The frame requires, in addition, a number of drilled and countersunk holes around the main body. This is done in one setting in a group of Kingsbury multiple-head drilling machines, as illustrated in Fig. 4-A, each one having six drill heads.

The initial frame cylinder is 4 9/16 in. in diameter, and seven inches long. The extruded end is reduced to 3/16 in. from the original thickness of 11/32 in., while the heavy body section is increased in thickness by 0.015 in. during the same process. Saving in material for this method amounts to about 20 per cent as compared with the former method.

Fig. 4-A—A number of drilled and countersunk holes in the body of the frame are produced in a single setting on the six-head Kingsbury machine seen here.



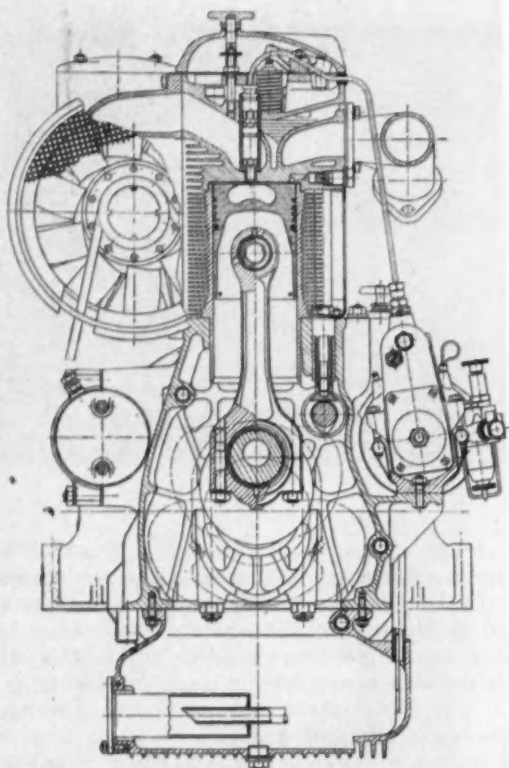
Pole Shoes

One of the most noteworthy cold working operations, because of close coordination between design and process engineering, is the technique for producing pole shoes. The cold working technique begins with mitre-cornered hot rolled steel blanks. The second stage is to bend the blank to the required radius of curvature in a minor press operation. The piece is then washed and coated with a solution of tri-sodium-phosphate to provide the necessary press lubricant.

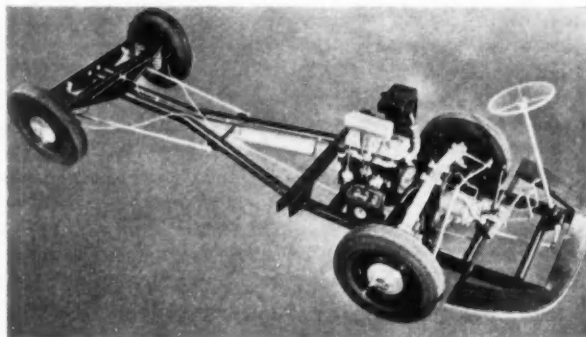
In the third step the curved blank is fed to a 700-ton National Maxipres for cold extrusion, a simple compression operation. Following this the piece goes to an adjacent press for sizing or coining. This holds the wings and body to a thickness tolerance of approximately 0.002 in. The procedure for making pole pieces by cold forming was described in

(Turn to page 130, please)

23rd Annual



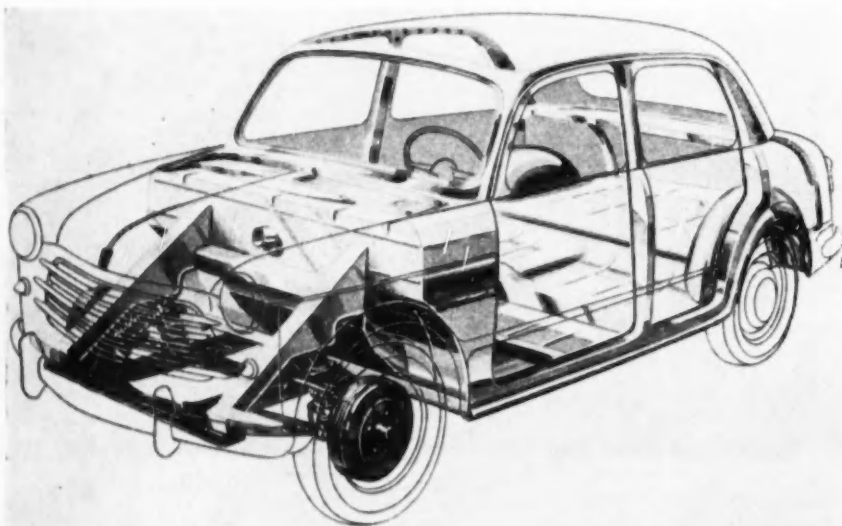
Transverse sectional view of four cylinder, air-cooled Diesel built by the Swiss Locomotive & Machine Co.



Tempo-Matador chassis with tubular frame and engine back of driver.



New Standard Vanguard four door sedan.



Integral body-and-frame construction of the Fiat 1100. The engine and front suspension sub - frame is shown in position.

Sub - frame assembly of the Fiat 1100.

Swiss Automobile Show

WITH 425 exhibitors and with 13 nations represented, the Geneva Automobile and Truck Show which was held last month attracted approximately a quarter of a million spectators.

Among the few entirely new models was an important one displayed by Fiat under the designation "1100." With a four cylinder engine of 66.4 cu in. piston displacement developing a maximum of 36 hp, and a wheelbase of 92 in., the four-door, four-passenger sedan weighs 1727 lb empty. Fiat has had a car with a 66 cu in. engine on its production lines for a number of years, but the model shown to the public at Geneva for the first time is an entirely new design, and has some features in common with the 1400 and 1900 cars brought out during the last 12 months.

Unit construction has been adopted, and this is very largely responsible for the reduction of 230 lb in weight compared with the earlier model with an engine of equal piston displacement. A feature of the construction is the use of a subframe, or cradle, composed of two side rails and three cross members to which the box-section front suspension brackets are welded. These brackets, in addition to receiving the two pairs of pressed steel support arms, are also the forward supports for the engine. These two front attachments are practically at the center of gravity of the engine and are composed of coil springs embedded in rubber. The third suspension point is by coil spring under the center of the transmission housing to the cradle rear cross member. Attachment of

By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

the cradle to the one-piece body is by means of 22 bolts. After disconnecting the open propeller shaft and breaking the usual connections, the entire power unit is separated from the body after withdrawing the bolts.

The four cylinder engine has a bore and stroke of 68 by 75 mm (2.67 by 3.07 in.) with valves slightly inclined in the head. Compression ratio is 6.7 to 1. The maximum output of 36 hp is obtained at 4400 rpm. Maximum torque is at 2200 rpm.

The usual layout is followed in the single-plate clutch, and four-speed transmission, which is synchronized on second, third and fourth.

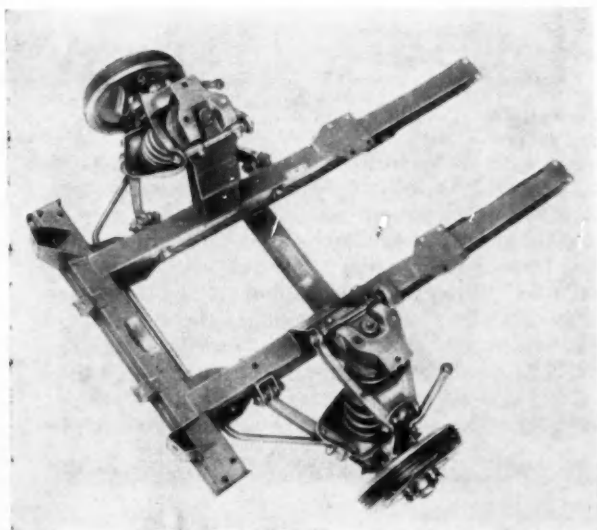
A feature of the front suspension is the considerable inclination of the coil springs, cradled between the upper and lower support arms, with telescopic hydraulic shock absorbers in their axis. An anti-roll bar is fitted. At the rear semi-elliptic springs are used, with the addition of inclined hydraulic shock absorbers and an anti-roll bar. The four wheel brakes, with light-alloy ventilated drums, are hydraulically operated and have a total friction area of 130 sq in.

Body lines in general follow those of the two larger Fiat cars. The new Fiat already is in production and is on sale in foreign markets. It has not yet been placed on the Italian market.

Standard presented an entirely remodeled Vanguard with completely new body lines. Mechanically, the four-cylinder, 127.6 cu in. valve-in-head engine has undergone only minor changes. Compression ratio is 7 to 1, and horsepower is 68 at 4200 rpm. Mounted in a chassis with box section side rails and a central cruciform construction, a new feature is a nine in. diameter Borg & Berg single plate clutch operated hydraulically under the Lockheed system and thus having very light pedal pressure. The clutch and the brakes are supplied from a common fluid reservoir. The steering gear incorporates either the recirculatory ball or an improved cam and roller system.

Pronounced changes have been made in the body. It now has four windows, the rear door is considerably wider and, by reason of the platform type rear, baggage space has been increased. Total length of the car has been increased by five in. As on the earlier

(Turn to page 126, please)



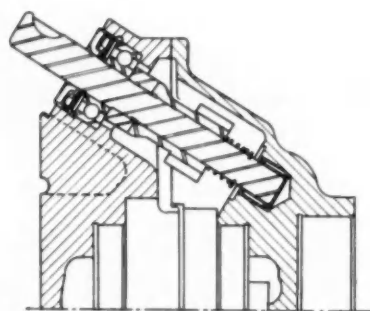
Details of Warner Gear's Mechanical Power Steering System

SOME of the general features of the mechanical steering system developed by the Warner Gear Div., Borg-Warner Corp., will be found in the 1953 Studebaker announcement which appeared in the February 1 issue of *AUTOMOTIVE INDUSTRIES*. The following descriptive material is intended to provide additional details of the construction of this device.

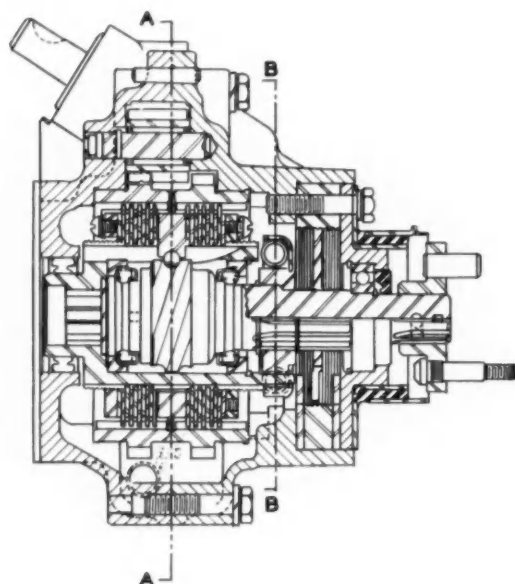
The power unit, or torque amplifier, supplied by Warner Gear contains a gear train consisting of five gears so arranged that one mechanical clutch—at the front—is turned continuously to the right while the one at the rear is turned to the left. Each of these multiple-disk clutches is composed of five driving disks splined to the inner periphery of its own driving gear and corresponding driven disks splined to the output hub which is common to both clutches.

As illustrated, a central pressure plate is mounted on the output hub between the two clutches, and is axially movable to engage one or the other of the clutches depending upon the maneuver. The pressure plate has three lugs, projecting through slots in the hub, the inner periphery of each lug being provided with a helical groove. These grooves serve as the outer race of a ball bearing screw thread, the inner race being formed in the hub.

In operation, when the control shaft is turned and there is relative lag in the displacement of the shaft and hub, the lag results in an axial displacement of the pressure plate due to the action of the helical ball bearing screw. This serves to move the pressure plate into contact with the appropriate clutch element. By this action the torque exerted at the steering wheel is amplified about four times in its actual effect upon the steering gear worm.

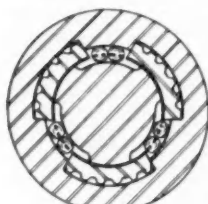


SECTION THROUGH
POWER INPUT SHAFT



It follows that when the effort on the steering wheel is removed, the relative movement between the control shaft and hub no longer exists and the entire mechanism returns to a fixed zero position ready for the next maneuver. Indexing of the load with the steering wheel is so precise and the actuating lag represents so small a fraction of the movement of the steering linkage that any tendency to oversteer is corrected so rapidly as to escape detection.

Since it is desirable to provide a positive "feel" in power steering, additional mechanism has been intro-



SECTION A-A



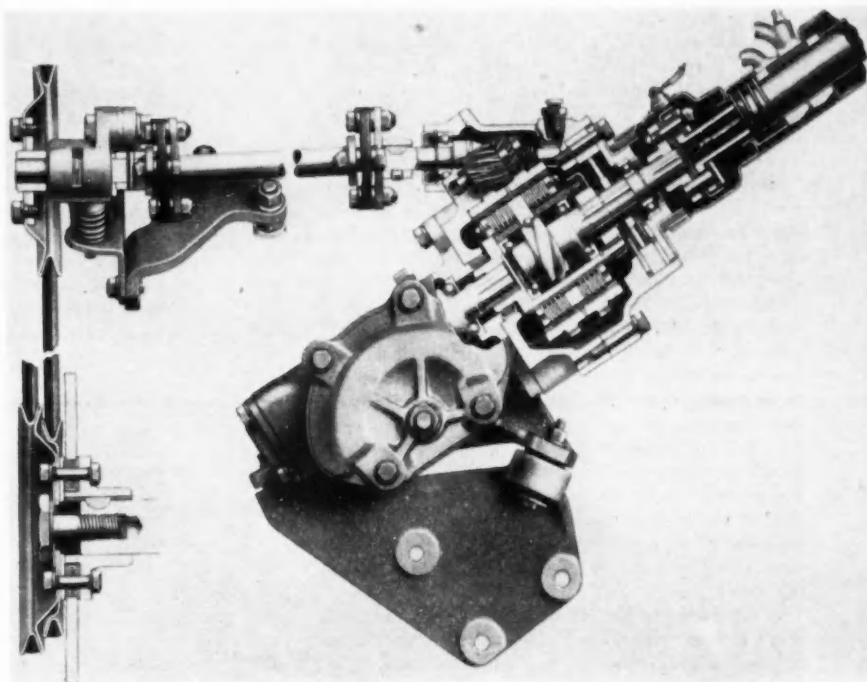
SECTION B-B



VIEW AT B-B SHOWING
PRESSURE PLATE LOCK PLATE

duced to give a sense of positive control when total steering effort is relatively light, as on easy turns or corrective steering on straight stretches of highway.

To this end, Warner Gear has introduced a cage containing three preloaded springs between the control shaft and clutch hub. Consequently, no rotational lag between these elements can occur unless the effort at the steering wheel exceeds a certain predetermined value. On Studebaker cars this effort is about two lb. However, it can be varied to suit the requirements of the automobile engineer simply by



(Above)—
Part - cutaway
view showing construction and arrangement of the power steering system units.

(Left)—
Details of the
power section of
the mechanical
power steering
system.

changing the springs. According to Warner Gear, it is a unique characteristic of the mechanical power unit that changes in the value of spring preloading does not affect steering effort proportionally. For example, doubling of the so-called "straight-manual" component, say from two to four lb at the steering wheel, increases parking effort only about 20 per cent. Another function of the preload spring arrangement is to effect full and prompt release of the clutches when the steering wheel is stationary.

Excessive stresses in the steering linkage are prevented by means of a special stop on the control shaft designed to limit its motion on either side. It consists of a helically-faced disk having a single thread about its outer periphery, slidably splined to the control shaft, and threaded into a stationary outer ring. As the disk turns within the threaded ring it travels along the shaft, stopping the rotation of the shaft when the disk strikes the fixed stops.

In case of power failure, rotation of the steering wheel still engages the clutches but in the absence of power, manual torque application is transmitted directly into the gear box. A simple ratchet, integral with the input gear, serves to permit free rotation of the gear train under these conditions.

According to Warner Gear the power unit requires very little engine power for its operation. Dynamometer tests indicate that straight-ahead power requirements do not exceed 0.15 hp at 40 mph. If operating temperature at sustained high speeds may be taken as a measure of power loss, it is reported that on one cross country run of 100 miles at an average speed of around 80 mph, the temperature of the power unit was increased only 40 F above that of under-hood air.

THE extent of automation in our plants today was largely determined on the basis of engineering studies based on our experience and the experience of the machinery industry in general. These, coupled with an economic analysis, determined how far it was practical to extend automatic handling operations.

Improvements and extensions to the automatic handling methods which we will talk about more in detail later must be carefully considered. There is an extensive educational program which must accompany the vast technological improvement program that industry is in the midst of today. There are many segments of our industry which must work closer together than ever before if our goal of reduced costs, increased quality and elimination of human drudgery is to be a success. Within our own plants this coordinated effort includes the designers of automation equipment tool and die designers, plant layout engineers, material handling engineers, machinery processors and management representatives from all levels. Outside of our plants, are the many manufacturers of machinery and equipment that are members of the vast team of engineering personnel working to the same goal.

In discussing automatic handling in our factories there are several main subjects which should be covered in order that a clear understanding of the problems involved may be obtained. Subjects are as follows:

Transfer Type Machinery

For our production lines of a few years ago, processing of parts manufacturing was based on a series of individual machine tools to perform the operations in small increments with manual handling between each machine. Processing today would and must be based on the combination of similar operations into an integrated

IN general, production people will be more highly trained on the average than in the past. To attain the type of worker required, it will be found that the scarce skills are not ready-made. The factory management of the future must be prepared to assist in this training program. The reward to the worker will be that jobs will be less monotonous and boring and that, if properly trained, the worker will become more interested in his job.

machine tool of many stations with automatic transfers between.

To illustrate the techniques used we can consider the production of automotive crankshafts. One portion of our machining process involved the drilling of six oil holes, six metering holes, six lightening holes, and inspection of the operation. Ten years ago 29 separate machines would have been required, while today the same department would require only three transfer type machines of eight stations each. The part would be loaded at one end and unloaded at the other end with all operations in between being completely automatic. This particular examination applies equally well to a number of other

Problems of the

operations—milling, broaching, reaming and tapping.

The combination of operations as outlined above describes the machine tool which is known as the transfer machine. We can readily see that combinations of this type cause profound changes on our entire production process. Our manpower must be redistributed to handle the problems which arise. We must take a fresh look at our methods of maintaining machinery elements and in applying our tools to the job. We find ourselves with production lines which in many cases are made up with groups of transfer machines which are completely automatic in themselves and which in turn must be coupled together in an economical fashion if we are to gain the full benefits of the transfer machine.

Emphasis on Automation

In our discussion of the transfer machine we can see that while similar operations are combined, there is a separate problem still remaining of connecting these new machines so that manual handling operations between the products of the various machinery builders will not be necessary.

To help understand the present emphasis on automation at Ford it is desirable to briefly trace the early history. The automobile industry as we know it today was successful because of the mass production techniques which made it possible to increase volume to such a point that the cost of a unit was within the reach of the average person.

The early automotive assembly line was in a sense the start of automation. The original chassis assembly line was utilized when Henry Ford introduced the idea of rolling the chassis along a route with operators and stock spaced along it. From this point, the moving chain conveyor developed and the operator was free to spend all of his time on assembly operations.

The conveyor became a symbol of mass production and conveyors were installed to perform many operations such as storage of materials, delivery to the line, and for assembly operations to move the part past the worker.

This program was made to produce an automobile of

a much smaller and simpler design than we know today. Machines were placed very closely together and plant layouts were largely on the basis of handling by means of overhead conveyors.

As the automobile became widely distributed and was considered as a necessity of modern life, public demand brought about changes in design, styling, size; the product became more elaborate and the production processes became more complicated. To meet the changes in styling, facilities were rearranged to use as much as possible the existing facilities without major tear up. This approach to the problem was satisfactory until in very recent years it became apparent that the products

AUTOMATIC FACTORY

By D. S. Harder, Vice President

MANUFACTURING

and

D. J. Davis

FORD MOTOR CO.

had changed so radically that major changes were required in our planning of production processes.

It was at this time that two departments were given full recognition to cope with present-day problems. A Materials Handling Engineering Dept. was set up to analyze the bulk movement of material from plant to plant and within the plants for storing, handling to the first operation, and for shipping methods. The Plant Layout Dept. was augmented by the addition of an automation activity which was chiefly concerned with the handling of parts between operations.

The early automation programs were centered about rearrangement of standard and existing machines to connect them with mechanical devices which would eliminate the inherent delay caused by manual handling. At the present time we find that our new programs are based on the wide introduction of machinery and equipment which have been designed with automation in mind.

Automation devices are designed to move parts into and out of production machines, turn the part over, rotate it, remove scrap and other related functions. These devices are timed with the process and are ordinarily completely automatic while in operation. A finished piece of automation equipment is made up largely of standard elements such as conveyors, air, hydraulic, and electrical control mechanisms arranged to obtain the proper movement for elimination of unnecessary manual handling operations.

We have found that a wide variety of materials can be handled with substantial savings and at the same time eliminate hazardous handling such as in large stampings, heat treat operations, forging operations and others; and that in many respects automation is the extended usage of conveyors which played such an important part in the early development of mass production of automobiles.

In the Ford Motor Co. proper emphasis has been placed on automation since the spring of 1947, when our first Automation Dept. was set up. We have found that the entire program has been accelerated and that the necessary coordination has been possible since that time.

Advantages

Lower production costs are an important consideration in all facilities planning. Automation assists greatly by relief of manual effort required in handling parts and the resultant inherent delay, especially in large volume operations. This does not mean elimination of all manpower, but rather a redistribution of manpower which will result in the need for more skilled workmen. It eliminates monotonous, repetitive work in many cases while at the same time increases production. We have found it possible to make worthwhile direct labor savings.

Very often the speed at which a machine produces a part is determined by the loading and unloading operations. Automatic transfer between operations has resulted in greater use factors for machines. The machinery has been able to operate closer to its designed capacity. Using high cost machinery to a greater degree is, of course, a definite advantage. We have found, for example, that in some press lines it was impossible to load the presses fast enough by hand to keep them running continuously. Automation made it possible to do this on many machines. The connection of all elements of a production process for a complete synchronization is a reality and has been accomplished on many of our machines lines.

Less scrap and fewer rejects often result from the use of automation which helps this program by reducing damage caused by parts hitting each other or falling to the floor.

(Turn to page 110, please)

THE future of automatic processes is inseparable from the future of our manufacturing industries in the constant fight to reduce cost so that consumption of our manufactured goods may be increased, and our employment may remain at a high level.

Interest Centers on

Production Panels at the ASTE



COMBINING the 21st Annual Meeting with a leadership conference and the dedication of a new National Headquarters building, the American Society of Tool Engineers held its largest and one of its most successful non-show affairs. Over 1200 technical personnel registered for the week-long meeting held in Detroit last month.

At the technical meeting, four panels were held in

conjunction with the presentation of several individual papers. The panels were concerned with such subjects as problems in production welding, future standard of living, thread production problems, and honing, lapping and superfinishing. Throughout the well-attended technical sessions, there was a great deal of interest shown as measured by the number and tenor of questions asked the various speakers. Included in this

Machine Tool Automation

By Julius Y. Kaplan

Arma Corp., Sub. American Bosch Corp.

ONE aspect of metal cutting which deserves serious consideration is the efficient removal of metal from a piece of work. Consider a "wide gap" lathe, for example, where a large cylindrical work is to be turned down in certain sections to a much smaller diameter.

If the spindle were to be driven at a constant rpm, the lineal cutting speed at the surface of the work would be a maximum at the start and would decrease directly with the radius. This surface

speed variation would be objectionable for two reasons: (1) machining time would be increased, and (2) optimum metal cutting speed would occur only at the start.

With a closed-loop speed control system, as shown in Fig. 1, it is a simple matter to achieve a constant lineal cutting speed. A potentiometer is geared to the cross slide so that it produces a voltage inversely proportional to the radius of the workpiece, or its equivalent, the cross slide motion. This voltage is used as an order to the spindle drive servo. The rotational speed of the work is thus increased as its radius decreases and a constant surface cutting speed is maintained.

In this application the servo is acting in two important roles: (1)

as an equation solver, and (2) as an automatic drive, maintaining the correct spindle speed as ordered by the cross slide potentiometer. It should be noted that this type of drive would be applicable to other machine tools, notably the milling machine; also to a variety of problems, for instance, winding machines or rolling mills.

Another aspect of efficient metal cutting is to remove metal at the maximum desirable horsepower. In the lathe illustrated, a wattmeter could be connected to the spindle motor, to provide a voltage proportional to the instantaneous horsepower drawn. If this voltage is bucked against a reference voltage (indicating the desired cutting horsepower) in the null circuit of

NEWLY ELECTED ASTE OFFICERS

Seated (left to right): First Vice President, Joseph P. Crosby, vice president and sales manager, The LaPointe Machine Tool Co.; President, Roger F. Waindle, vice-president, Cannon-Muskegon Corp.; Second Vice President, Dr. Harry B. Osborn, Jr., Technical Director, Tocco Division, The Ohio Crankshaft Co.; Treasurer, Harold E. Collins, Manager, Process Engineering Department, Hughes Tool Co. **Standing (left to right):** Third Vice President, Howard C. McMillen, Plant Manager, Philco Corp.; Executive Secretary, Harry E. Conrad; Assistant Secretary - Treasurer, Wayne Ewing, Partner, Arrowsmith Tool & Die Co.; Secretary, Raymond C. W. Peterson, Owner, Peterson Engineering Co.

Annual Meeting

report are abstracts and/or extracts of some of the papers read at the conference.

In respect to Society business, officers were elected for the fiscal year 1953-1954. Roger F. Waindle, vice president of Cannon-Muskegon Corp., Muskegon, Mich., was elected President of the ASTE. First Vice President elect of the Society is Joseph P. Crosby, vice president of Lapointe Machine Tool Co., Hudson,

Mass. Second and Third Vice Presidents, respectively, are Dr. Harry B. Osborn, Jr., technical director of Tocco Div., Ohio Crankshaft Co., Cleveland, Ohio, and Howard C. McMillen, plant manager of Philco Corp., Bedford, Ind. Raymond C. W. Peterson, owner, Peterson Engineering Co., Toledo, Ohio, and Harold E. Collins, manager, Hughes Tool Co., Houston, Texas, were elected Secretary and Treasurer respectively. The Assistant Secretary-Treasurer is Wayne Ewing, partner, Arrowsmith Tool & Die Co., Los Angeles.

In addition to electing officers, the Society also elected the following men to the Board of Directors: Willis G. Ehrhardt, partner, Ehrhardt Tool and Machine Co., St. Louis, Mo.; George A. Goodwin, chief process engineer, Master Electric Co., Dayton, Ohio; Ben J. Hazewinkel, president, Daily Grinding, Inc., South Gate, Calif.; Gerald A. Rogers, engineer, Rudel Machinery Co., Ltd., Montreal, Canada; Richard A. Smith, chief tool engineer, Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.

Waindle, Crosby, Osborn, McMillen, Peterson, and Collins were also elected to the Board of Directors. Bellamy is automatically a member of the Board as immediate Past President.

The ASTE's new national officers assume their duties at once. The new national directors take office in October.

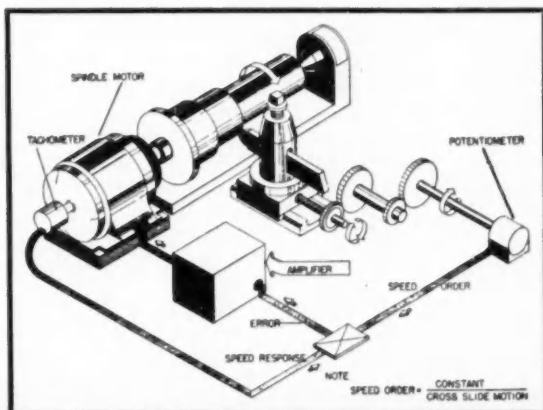
One of the major themes at the leadership conference, attended by chapter chairmen throughout the United States, was the recruiting of young engineers. C. V. Briner, past president of the ASTE told the conference attendees, "Go back to your own organization and see how many young engineers you can scrape off clerical jobs." According to Kenneth H. Meade, General Motors Education Section Relations head, the U. S. is about 95,000 engineers short of the combined needs of industry and the Armed Forces.

The new Headquarters building, located at 10700 Puritan Avenue, Detroit, was formally dedicated by L. B. Bellamy, now past president of the Society.

a servomechanism supplying cross slide motion, the cross slide will automatically adjust the tool feed-in rate to regulate the spindle mo-

tor horsepower consumption at the correct value. It should be noted that, for the constant spindle speed lathe control discussed here, spin-

dle power is proportional to motor torque. Thus a torque transducer would suffice as a measurement of horsepower.



Rubber to Metal Bond Design

By J. H. Gerstenmaier
Goodyear Tire & Rubber Co.

SURFACE CONDITION — There are widely different methods of preparing metal for rubber bonding, depending on the material and the adhesive. Often the adhesion surface is protected after the application of the adhesive, by applying cover coats of rubber or rubber-resin blend cements, where these are necessary to retain the properties of the base adhesive. (Continued, next page)

AUTOMATION

Fig. 1 — Spindle drive servo-mechanism for constant speed surface cutting.

TABLE I
ADHESION VALUES FOR VARIOUS
SURFACE CONDITIONS

Surface Condition	Relative Adhesion Value
a. Control grit blasted surface.....	100%
b. Finely polished surface.....	147%
c. Hammered finish.....	97%
d. Small longitudinal corrugations.....	86%
e. Large longitudinal corrugations.....	70%
f. Small transverse corrugations.....	63%
g. Large transverse corrugations.....	59%

The condition of the metal surface has a direct effect on the adhesion values. Different results are shown in Table I as a tabulation of a laboratory test where varying bond strengths are obtained on various types of surfaces on the same steel with the same rubber and metal preparation. Specimens were subjected to a shear loading. The control grit blasted surface is listed as the 100 per cent value.

These test results show conclusively that the use of corrugations to increase adhesion area does not help the adhesion bond strengths, but actually detracts from them. The best type of adhesion surface is a finely polished continuous surface, but such refinement is generally not necessary. Finishes produced by smooth rolling, drawing, machining, and grinding operations are generally satisfactory provided that slag inclusions, pits, folds, seams, and burrs are avoided. Smooth cast or gouged surfaces are acceptable also, providing that protruding sprues, flash fins, pits, or porosity, and other surface defects are not present. It is generally necessary to sand blast

or pickle adhesion surfaces to remove any rust or scale from the surface before bonding.

Some of the important product design considerations which must be taken into account in the design of new parts are as follows:

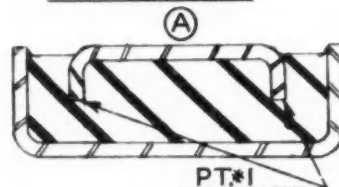
(1) Factor of Safety—If the part is a functional part which in operation is loaded in shear or tension, the part must be designed with a factor of safety for the bond. While bond strengths of 250 psi can be maintained consistently in the design of mild steel parts, it is desirable to incorporate adequate adhesion area so that under maximum dynamic load the bond is not stressed in excess of 125 psi. This gives a safety factor of two to one under the worst conditions. Because of space limitations, at times it is not possible to do this, but wherever possible, keeping the bond stress low is good design practice.

Tension mountings are not used very frequently because the characteristics of rubber in tension are not good. A small nick in a rubber fiber tends to progress and cause the whole mounting to fail. When ma-

terials other than mild steel are used, the difference in adhesion values between the metal used and steel should be taken into consideration.

(2) Edge Effects—Edge effects are very important on shear and compression mountings and, wherever possible, liberal fillets should be used at the edge junction points of the rubber to metal bond. Figure 1 shows both poor and good design practice with regard to edge radii. At (A) is shown a mounting which is poorly designed from an edge stress standpoint. At (B) is the same mounting with the edge fillets incorporated as they should be in a good design. View (C) shows another mounting which is poorly designed; (D) shows the same mount redesigned considering edge effects. The advantage of making the mount as at (D) rather than as at (B) is the fact that there is no undercut on the part, and it would be easier and more economical to mold. Strictly from a performance standpoint, however, (B) would be preferred.

POOR DESIGN



GOOD DESIGN

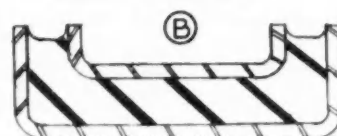


Fig. 2—Rubber-to-metal bond design for stress concentration.

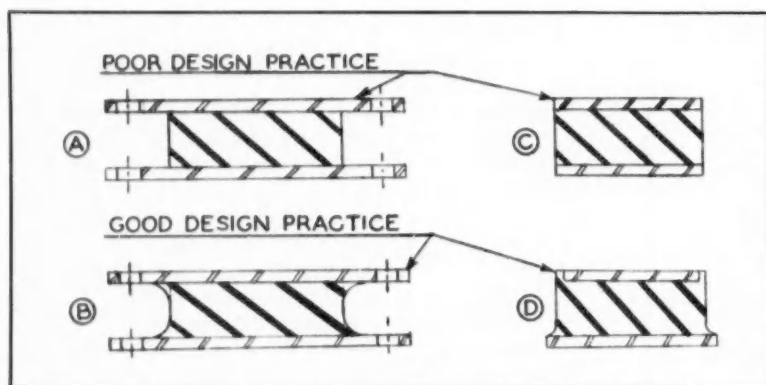


Fig. 1—Edge radius design for rubber-to-metal bonds.

It may seem a small matter whether edge radii are used or not, but actually it is quite important on shear mountings. Test results show that mounts which have edge radii may run as much as 50 per cent longer on fatigue tests than a similar mount without edge radii.

(3) Stress Concentration—Stress concentrations indicated in Fig. 2 should be avoided wherever possible in product design of rubber parts. The high stress concentration at point 1, view (A), may cause failure of this mount along the adhesion surface even though the adhesion is good. A method which would accom-

(Turn to page 80, please)

Evolution of the F-86 Sabre Jet Fighter

BY RAY RICE

Vice President and Chief Engineer
North American Aviation, Inc., Los Angeles, Calif.

THE F-86 Sabre series was born when designers at North American Aviation in 1944 produced several fighter configurations, all with straight wings, which were submitted to the Air Force that year. The USAF wanted a day fighter of medium range which would work also as an escort fighter and dive bomber. From the several designs, then, they selected one with a smaller fuselage, permitting some fuel to be carried in the wings and external tanks. This was the form of the embryonic Sabre jet.

Since its original design the F-86 development has been influenced primarily by speed requirements, necessitating changes in general configurations, development of new type structures, and invention of new control devices. Provision had to be made also for pilot protection, and numerous manufacturing problems never before encountered had to be solved.

During May, 1945, the company got a letter contract authorizing construction of three XF-86 airplanes. The first version was approved in mock-up form by the USAF in June, 1945. It was characterized by a straight wing and a straight line flow of air and exhaust gases from nose intake to tail pipe.

But the primary mission of the F-86 was speed and the straight wing version fell short of the Air Force requirements of a 600-mph airplane. However, North American engineers, working with advanced wind tunnel data on swept wings obtained in Germany after VE day, discovered that a swept-wing design would give the Sabre about 70 mph greater top speed. More than 1000 wind tunnel tests were made to prove the new wing and make it work.

During this time the wing of an unswept Messerschmitt fighter was sent to the Los Angeles plant for study of its slat configuration. Many wind tunnel tests were made on wing slats for the Sabre, which were designed to give the plane safe performance at low speeds, for the greatest problem with the swept-wing design was the stall of the wing tip. Extending and retracting automatically in response to aerodynamic forces on the wing, the slats provided satisfactory stalling characteristics.

The information gained by the company's sub-sonic wind tunnel at the Los Angeles plant was not available anywhere else in America, and its work was

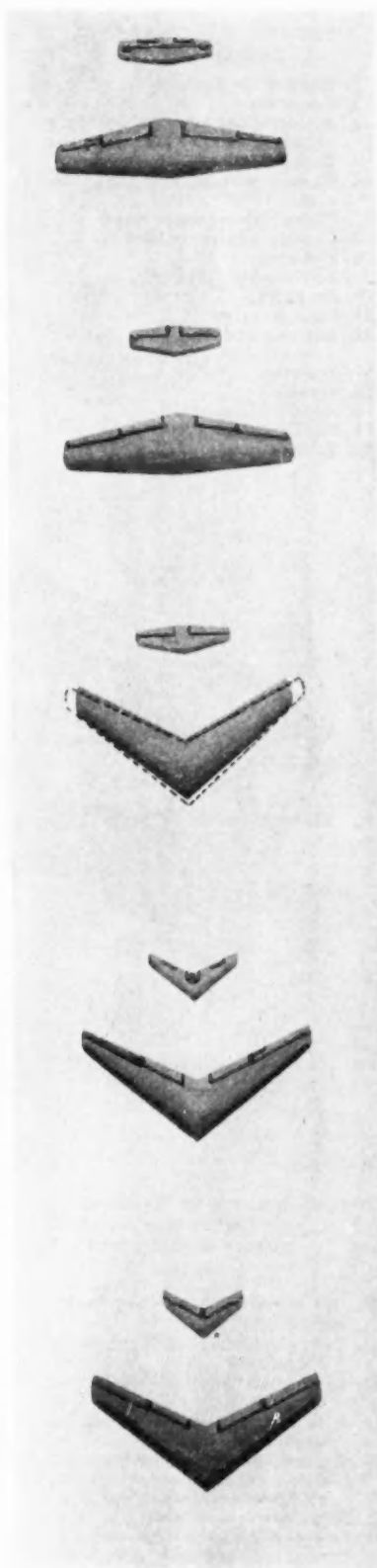
F-51 Mustang
wing.

Straight-wing
Sabre design.

Wind tunnel variations — swept-wing, straight tail.

Wind tunnel study — high aspect ratio swept wing.

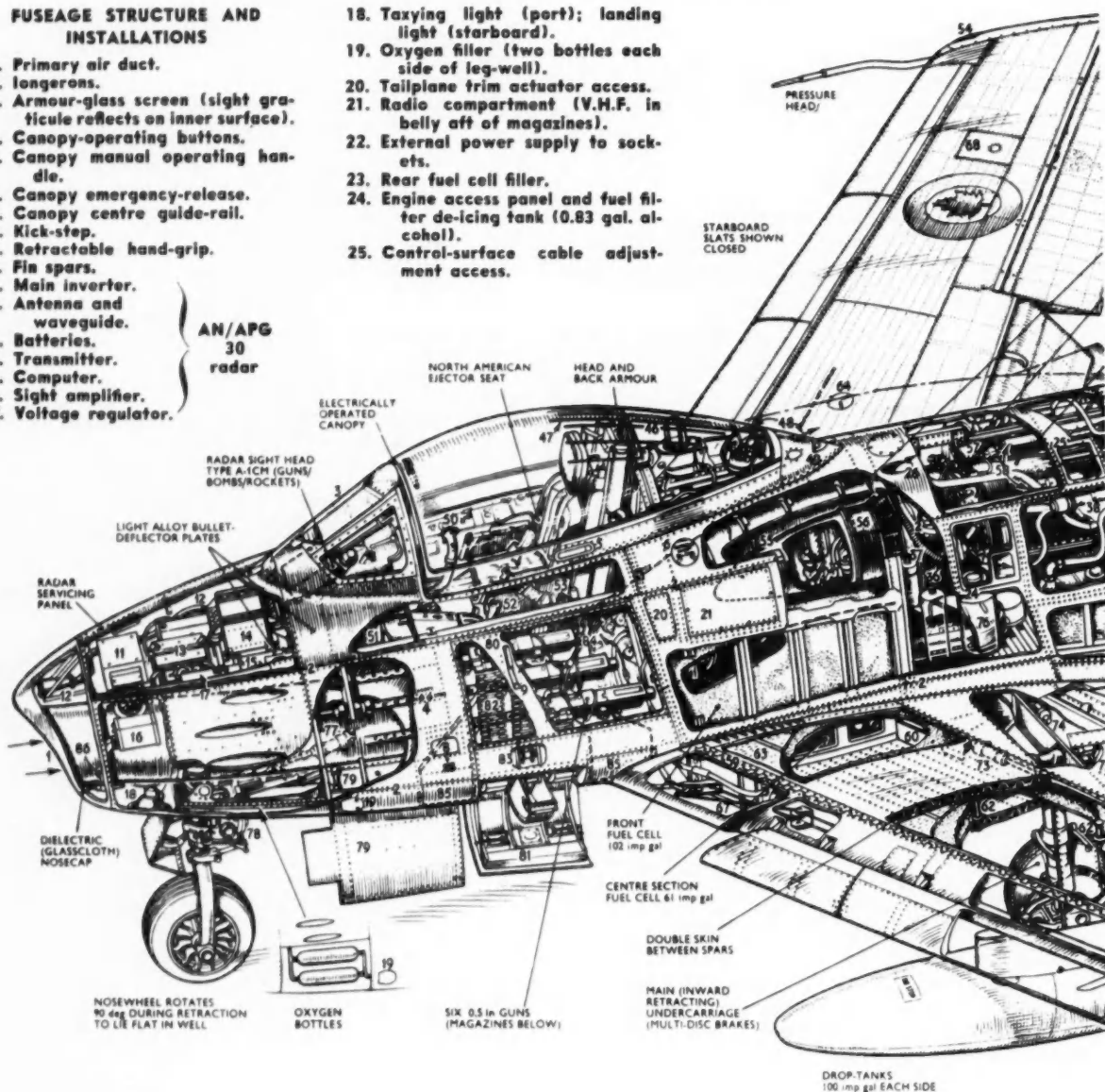
Final F-86 Sabre
swept wing configuration.



SABRE F-86E

FUSEAGE STRUCTURE AND INSTALLATIONS

1. Primary air duct.
2. Longeron.
3. Armour-glass screen (sight graticule reflects on inner surface).
4. Canopy-operating buttons.
5. Canopy manual operating handle.
6. Canopy emergency-release.
7. Canopy centre guide-rail.
8. Kick-step.
9. Retractable hand-grip.
10. Fin spars.
11. Main inverter.
12. Antenna and waveguide.
13. Batteries.
14. Transmitter.
15. Computer.
16. Sight amplifier.
17. Voltage regulator.
18. Taxiing light (port); landing light (starboard).
19. Oxygen filler (two bottles each side of leg-well).
20. Tailplane trim actuator access.
21. Radio compartment (V.H.F. in belly aft of magazines).
22. External power supply to sockets.
23. Rear fuel cell filler.
24. Engine access panel and fuel filter de-icing tank (0.83 gal. alcohol).
25. Control-surface cable adjustment access.



This is by far the most detailed sectional view of the world's first supersonic fighter to be published to date. It is illustrative, incidentally, of the complex equipment which characterizes the fighting aircraft of today.

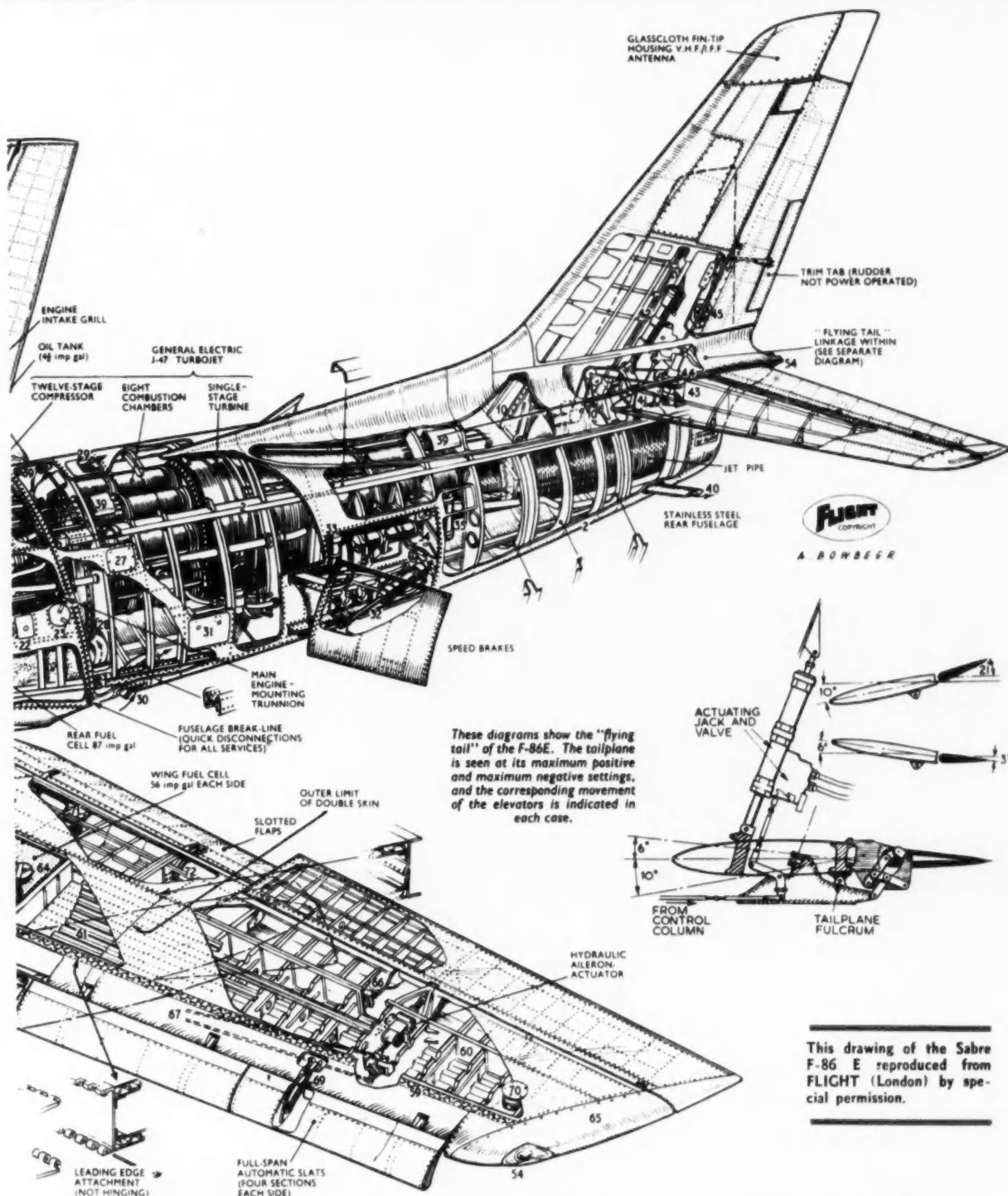
26. Hot outlet from air-conditioner.
27. Igniter plug access.
28. Compressor section ventilation air intake.
29. Compressor section ventilation air outlet.
30. Rear fuselage ventilation air intake.
31. Ground fire-fighting access; data case; power control emergency hydraulic pump.
32. Speed-brake actuating jack.
33. Emergency control reservoir.
34. Emergency hydraulic accumulator.
35. Power control compensator.

36. Power control normal accumulator.
37. Power control normal reservoir.
38. Heat exchanger (cockpit air-conditioning system).
39. Control-surface cable-duct.
40. Fuel-tank vent.
41. Tailplane front spar moved by (42).
42. Tailplane actuator jack.
43. Tailplane rear spar (hinged).
44. Rudder control quadrant.
45. Tab-actuating motor.
46. Radio compass (type ARN-6) loop antenna.
47. Radio compass sense antenna.

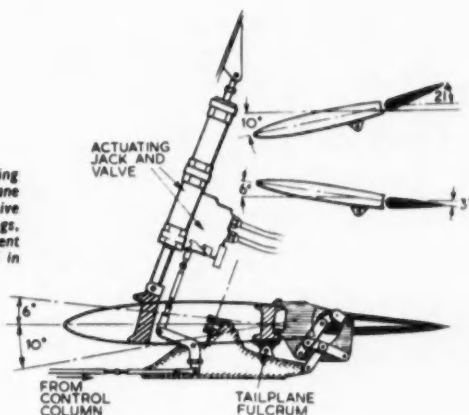
48. Cockpit pressure regulator and outlet.
49. Upward identification light.
50. Control column.
51. Port rudder-pedal.
52. Engine-power control.
53. Anti-g valve.
54. Navigation lights.

ENGINE

55. Nose cone (engine auxiliaries within).
56. Starter/generator.
57. Engine steady and guide-rail.
58. Ignition units.



These diagrams show the "flying tail" of the F-86E. The tailplane is seen at its maximum positive and maximum negative settings, and the corresponding movement of the elevators is indicated in each case.



This drawing of the Sabre F-86 E reproduced from FLIGHT (London) by special permission.

WING STRUCTURE AND INSTALLATIONS

59. Front spar.
60. Rear spar.
61. Corrugations between double skin.
62. Constructional posts bolted through fuel cell.
63. Glasscloth liner (anti-chafe and bullet deflector).
64. Fuel fillers.
65. Moulded wing-tip.
66. Irving balanced ailerons.
67. Aileron control cables.

68. Aileron actuator access.
69. Slat roller and guide-rail assemblies.
70. Gyrocompass flux unit.
71. Flap actuating motor and flexible coordinating shaft.
72. Flap roller-and-guide-rail assemblies.

UNDERCARRIAGE UNITS

73. Mainwheel operating jack.
74. Uplock cylinder.
75. Downlock cylinder.
76. Wheel-well with raised portion for brake drum.

77. Nosewheel operating jack (under air-duct).
78. Steer/damp unit (nosewheel steers 23 deg each side).
79. Nosewheel door and jack.

ARMAMENT

80. Gun access panel.
81. Magazine door/entry step.
82. Flexible belt-guides.
83. Feed boosters.
84. Gun-heating cables.
85. Spent case and link compartments.
86. Camera gun.

responsible for Sabre jets scoring a remarkable jump in schedule. On November 1, 1945, the Air Force accepted the company's proposal to scrap the straight-wing design in favor of the swept wing, and the shape of the Sabre as it is known today was established.

The principal structural innovations in the F-86 design were in the wings. Tapered skins were made for the first time on a production basis by North American for the new airplane. By tapering the skin instead of making it by a series of overlapping sheets of varying thickness, the engineers were able to make a major saving in weight. Specially equipped milling machines, using carbide-tipped fly cutters up to 12 in. in diameter, were set up at North American to mill

tioning and pressurization and for windshield de-icing. The same air was used for pressurizing an anti-G suit worn by the pilot. Protection for the pilot was additionally provided by an ejection seat. Armament included six .50 caliber fixed guns. Fixtures were provided to carry eight high-velocity aircraft rockets under each wing, and an alternate installation accommodated up to 2000 lb of bombs. Guns, rockets and bombs were aimed by a radar computing sight.

On February 28, 1946, a cockpit mockup of the F-86 received Air Force approval and early in August that year the basic release of engineering drawings for the XF-86 was made to the manufacturing division. In December a letter contract for a number of F-86A airplanes was approved.

On August 8, 1947, the first XF-86 Sabre was completed by the company and turned over to flight test. The first flight was accomplished on October 1. The following spring, April 25, 1948, George Welch, North American engineering test pilot, flew the XF-86 at Mach 1. Later, F-86A airplanes were flown at Mach 1 in routine flights without incident. The first two A's were accepted by the Air Force on May 28, 1948.

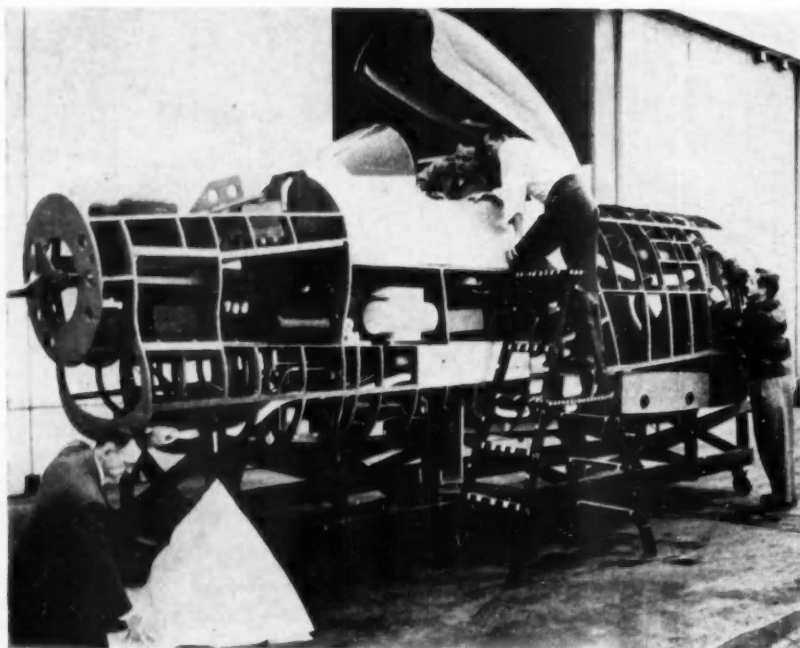
*The Air Force didn't wait long to see what their new fighter would do on a speed course at Edwards Air Force Base. On September 15, 1948, Major Richard L. Johnson flew a standard combat-loaded F-86A over the measured three-kilometer course for a new official world speed record of 670.981 mph. This record was broken by the F-86D Sabre on November 19, 1952, by Capt.

J. Slade Nash, flying a course marked out on the desert on the shores of Southern California's Salton Sea. The new figure was 699.9 mph.

The Air Force started accelerated service tests of the F-86 at Edwards AFB in January, 1949. The next month the 94th Sqdn., First Fighter Group at March Field, became the first to be equipped with Sabres.

High speed performance, control and stability of the F-86 proved excellent. The Sabre flew smoothly, comfortably and without strain in level flight at speeds greater than design dive speeds of straight-wing aircraft. Moreover, the airplane's response and control was normal and precise at these speeds. External installations of fuel tanks, rockets or bombs imposed only slight restrictions. Handling and stalling characteristics at low speeds were comparable to those of

(Turn to page 100, please)



Engineers build the F-86D first in wood to check their two-dimensional drawings for errors with the replica.

the skins, a process something like sculpturing the metal sheet to the desired shape. A double skin structure with "hat sections" between layers replaced conventional rib and stringer construction in some parts of the wing.

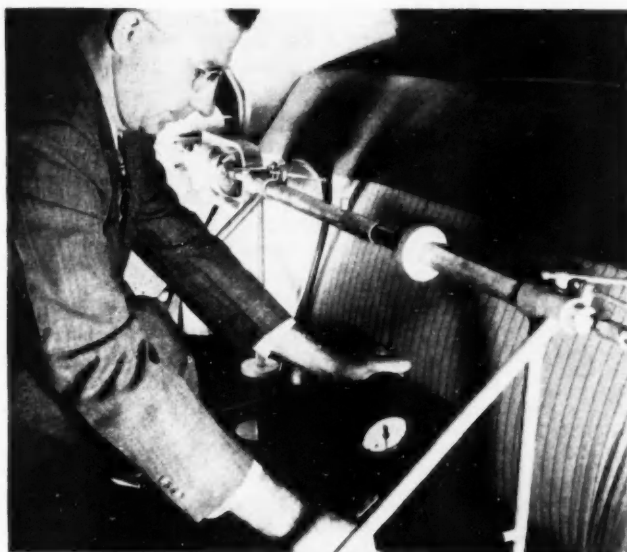
Several features of the F-86 design were important from the standpoint of serviceability. The first was a division of the fuselage into two main sections, joined just aft of the wing trailing edge by four bolts. This made possible the removal and replacement of an engine in less than 30 minutes. The second feature was the use of interlocking type hinges to attach outer panel nose sections to allow for quick, easy access to cables and equipment forward of the front spar.

As in the case of the North American B-45 Tornado, hot compressed air bled from the final stage of the engine air compressor, was used for cockpit air condi-



Test for effectiveness of windshield sealing and operation of windshield wipers.

Special Tests at GM Proving Ground



A pneumatically actuated brace applies pressure to doors.

Arrangement of equipment to evaluate noise level in body of car.



SOME impression of the scope of experimental work being conducted by the Fisher Body Div., GMC, at the General Motors Proving Ground may be gained from the sampling of views reproduced here.

From the standpoint of the car buyer, one of the most important considerations is protection from the weather. Simulated down-pour or a drizzle, even while the sun is shining, is accomplished by means of the rig illustrated. The test car, as shown, is fitted with a spray harness which is fed from the trailer. The latter carries two, 55-gal drums of water and a pump. The spray, directed on the windshield, tests wiper blades and motors as well as the effectiveness of windshield sealing.

A pneumatically actuated brace is used to apply pressures up to 400 lb on doors to test effectiveness of locks and latches. As illustrated, the brace is applied on a test car, then the car is driven over the Belgian block stretch to wrench and weave the body structure.

Noise level in various parts of a body now is evaluated by means of the new binaural technique, using two microphones in positions corresponding to the human ears, and recording the sound pattern on a magnetic tape recorder employing two separate channels. When played back through a headphone with a receiver for each ear, it gives an exact duplication of the recorded sound. This method has been found particularly effective in evaluating different types of sound-deadening materials.

Advanced Techniques Represent Collective Efforts of Many Specialists, All of Whom Play Important Part in Final Selection of Special Equipment Required for Higher Production, Improved Quality, at Lower Cost

How Special Machinery

AT THE present time more than 1100 special automatic machines of various kinds—for assembly, coil winding, packaging, and manufacturing operations—have been built and are now in use in the plants of the Delco-Remy Division, General Motors Corp. in Anderson, Ind. The object in this article is to trace the developments leading to decisions for the installation of special equipment; and to show the intimate relationship that exists between management, design engineering, process engineering, and production supervisors. Advanced techniques no longer are the product or brain child of one master mind but represent the collective action and contributions of many specialists. In its essence, this process is best represented by the concept of intensive committee activities and cooperative effort.

The question often arises—"Just why do we need special machinery?" The prime objective naturally is the reduction of costs but other factors such as improved quality, reduced operator fatigue, and elimination of safety hazards will influence the selection.

Before delving into the actual procedure at Delco-Remy in the design and construction of special machinery for automotive electrical products, several factors of utmost importance should be mentioned without which it would be futile for anyone to even consider the use of special equipment.

The first of these factors involves management. Only under progressive and patient management is it possible to acquire and use special machinery. Without optimism the initial gamble will not even be made because it is not possible to see an identical machine

Perspective of a portion of the line of secondary coil winding machines designed and built by Delco-Remy. Each one winds ten coils at a time with 21,000 turns of No. 39 wire. Insulating paper is wound automatically over each layer of wire.



An example of another type is this D-R vertical molding machine. It is fitted with two lower half-molds on an oscillating table. The design utilizes the cure time to remove molded parts, clean the mold, and load inserts and molding material for the next cycle.

**By Robert L. Kessler, Master Mechanic
Delco-Remy Division, General Motors Corp.**

Is Developed

in operation in some other plant. A progressive manager will realize that any special machine will have more faults than a standard machine by virtue of it being the first of its kind. However, if he has confidence in his organization, he will know that these faults will be corrected as they arise.

A second factor is the availability of skilled tool and maintenance help. As is true of any machinery, proper care of tools, normal repair, adjustments, and lubrication are very important. When we consider the progress and applications that have been made in the past few years in the field of hydraulics and electronics, this type of skilled help is now a "must" in the successful use of special machinery.

The third factor concerns the attitude of production supervisors. Every effort must be made to con-

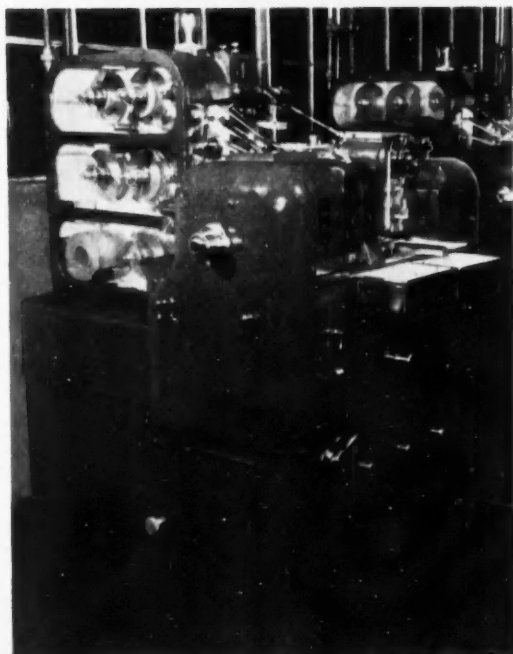
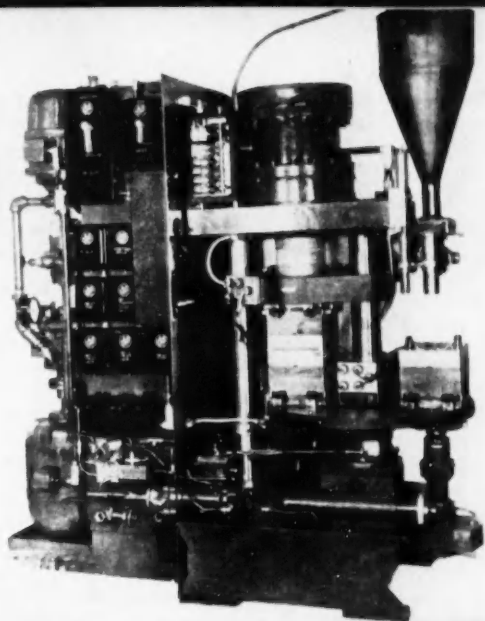


Illustration above shows Delco-Remy automatic condenser winding machine. It winds alternate layers of aluminum foil and paper, cuts off, and applies adhesive to secure the winding. Three operators can look after a group of these machines with ease.



Shown at left is inline form of indexing machine for assembling brush hangers. The riveting stations to the right are provided with hopper feed.

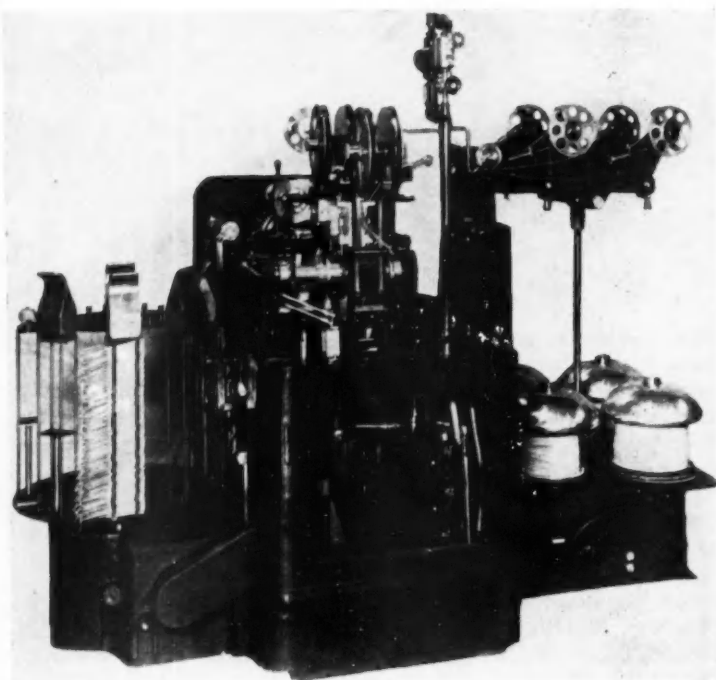
vince them from the start that their interests are being considered and that they are a part of the "team." They should be brought into design meetings and their suggestions and opinions given careful consideration. A "selling" job is necessary to be certain they understand that the success or failure of special equipment to a large degree is a reflection of their supervisory ability. If their cooperation can be secured the possibility of successful operation is vastly increased.

Where do the ideas for special machinery originate? The answer must be broad and general since circumstances often dictate the source. It may be that the profit situation on a particular product is not favorable and an analysis of the present production methods produces ideas for a different tooling approach. Engineering changes in design or newly designed products may develop the need for special machinery. Employee suggestions, or production supervision may submit ideas which result in new and special equipment. Finally, top management or members of the Production Engineering Group may make suggestions, which eventually lead to special machinery. For example, a few years ago some members of our Production Engineering Group visited a plant which made shotgun shells. The methods used by that plant looked favorable for small parts assembly and, as a result, automotive type condensers are assembled in our plant today using some of the features employed in the shotgun shell plant.

While ideas may flow freely, the job of screening out those which are not practical from an economic standpoint is of utmost importance and requires an extremely accurate analysis of the many factors involved. In the first enthusiasm for a new idea many factors which could have a detrimental effect are apt to be ignored. The labor savings can be roughly estimated at this time by assuming a production figure for the new method. In most cases the cost of the equipment can also be roughly estimated. If these figures appear favorable then a detailed analysis should be made covering all the other factors which may influence the final decision. Also, if the job is sizable, it will be wise to call a meeting of representatives from Production Supervision, Product Engineering, Plant Engineering,

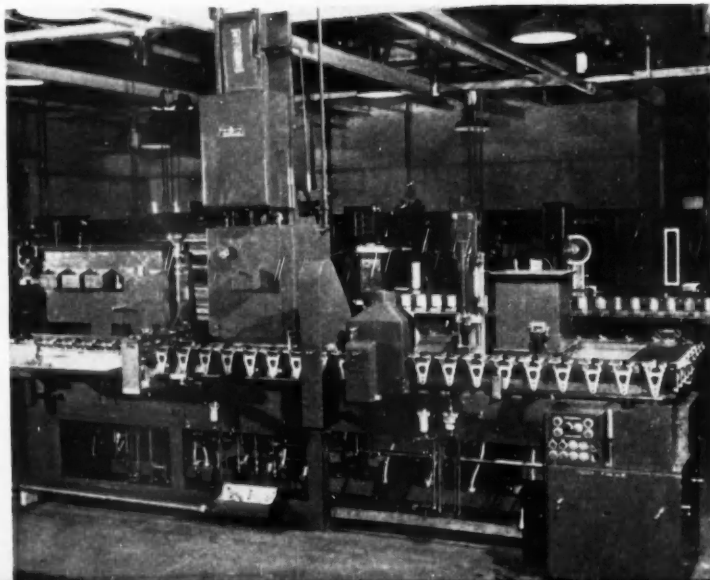
Tool and Machine Building Supervision, Machine Design and Cost Accounting, for the purpose of discussing these factors as they apply to each group concerned.

The actual present production rate might be assumed to be so apparent as to require no check. However, a careful study of the actual production possibility of the present method may show that the rate is or could be considerably different from what is generally



Example of an automatic coil winding machine for winding and papering armature coils. A group of such machines can wind more than half a million coils a day.

An example of an inline indexing machine for the assembly of distributor levers. This type of machine can be fitted with special attachments for welding, riveting, machining, as well as automatic feeding devices for small component parts. In addition, automatic inspection stations can be applied as required.



recorded or accepted. The actual rate of production may be lower than it is thought to be, but other operations in the department may be enough better to show a good departmental efficiency. On the other hand, actual rate of production may be higher than recorded. Then, too, relatively inexpensive changes may make it possible to produce at a higher rate. The proposed method should be compared to the best possible performance of the present method.

Fixing the Production Rate

The production rate of the proposed machine may be fixed by the rate of a balanced line in which case there would be no value in producing more pieces than are fed to it by preceding machines, or can be used by machines following it. If the machine is not in a balanced lineup, the production rate may be determined by the cost of the equipment. If multiple machines are required it may be possible to operate more than one per operator and this might be profitable even though the productive rate per machine is lowered.

Due to seasonal demands or other causes, the immediate production schedule may be high or low. One of the fundamental facts to know is the maximum production that will be required and the number of daily hours or work shifts that will be available to produce this schedule.

Cost of the special machine should include the cost of designing, building and "bugging." The most difficult part of the estimate is the latter which may run from 10 per cent to 100 per cent above the cost of building the machine originally. A fair average figure would be about 20 per cent.

Checks with sales and engineering departments will show whether there will be sufficient total production to be certain that the cost of the equipment will be amortized before it is obsoleted.

When a considerable expenditure is contemplated for new equipment, it is wise for sales and engineering to study the model for desirable changes that might improve the quality of the product and at the same time add to the prospective savings. The proposal to change a method of manufacturing may stimulate the imagination of the product designer, causing him to think of possible changes which had not previously been under consideration. Often minor concessions by engineering will simplify the special machine.

It may be possible to design the machine so that it does not too seriously restrict the possibility of producing similar pieces of different size or design. This should be given thorough study otherwise even minor product design changes might obsolete expensive production facilities. Where there is complete assurance that no changes are contemplated over a long period, the cost of the machine may be kept lower by not making it universal.

The type of operator or degree of skill required may determine the hourly rate to be paid. This is a factor which will influence the potential saving.

Effect on preceding or subsequent operations must be considered. Very often the use of a special machine to perform an operation will be affected by the condition of the parts fed to it to such an extent that improvement or changes might be required in the preceding operations. This may effect the saving adversely or lead to further cost reduction. Generally, the necessary improvement in the parts to be processed in automatic machines would have been as desirable and profitable for hand operation. For instance, in the manufacture of automotive generators, the use of special automatic lead connecting machines forced an improvement in the commutator notching operation. Although this was not initially contemplated, the new machines which were then developed for this purpose not only gave the required improvement but paid out in eighteen months.

Calculating Return On Investment

The cost of installation, conveyors, ventilation and improved facilities such as transformer capacity, also power, air, gas and water lines, and all other costs that may be incurred in the use of special machinery should be included for the purpose of calculating return on investment.

In making disposition of replaced equipment, salvage value of the replaced equipment may be credited to the savings of the new method.

The new method may change the amount of material required per piece or may change its specification. If the use of a more costly material is required for the successful performance of the proposed equipment, the additional cost may nullify other savings.

Scrap or reoperation cost should be considered in the justification of special equipment. As an example—a

special machine was built to make a part previously purchased outside, but when the cost of scrap parts was charged against the saving, it was found that the special machine was not making the estimated return on the investment.

A part of the saving may be nullified by ignoring the increased cost of tools and non-productive materials required by the new method. On the other hand, the new method may decrease the cost of such materials. On one occasion, a special broaching machine was built for removing welding flash from a part. There was no labor saving but the lowered cost due to eliminating the purchase of grinding wheels justified the investment.

Important Factors In Cost of Operation

Power, steam, gas and air may be important factors in the cost of operation and should be checked when an estimate is being prepared. It may cost as much for an air blast to eject heavy pieces as it does for labor to unload by hand.

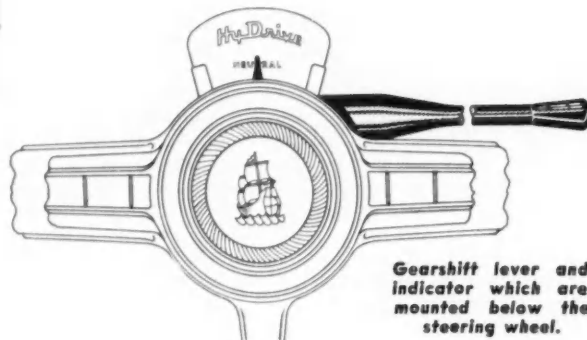
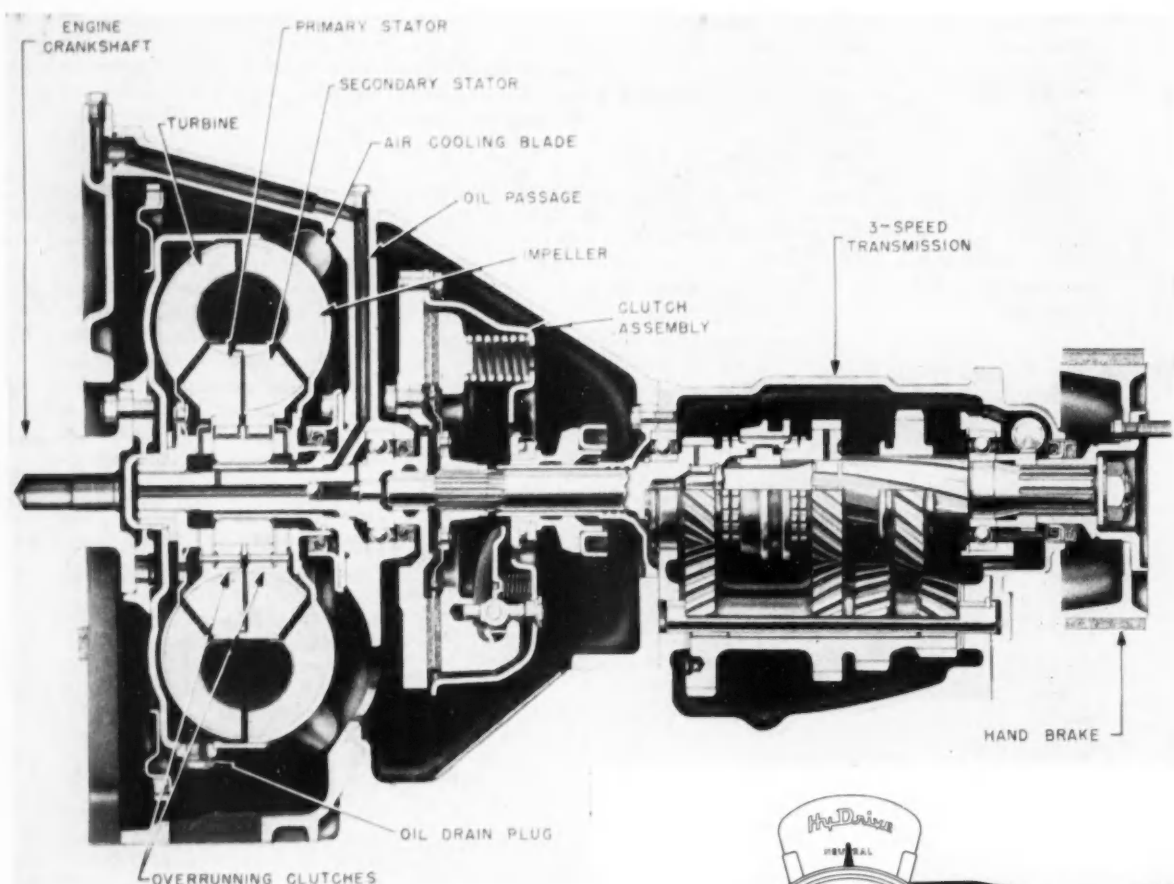
Cost of machine and tool maintenance should be included in the estimated cost. They may go either way, but on the average the machine maintenance cost will increase if the equipment increases in complexity. It may temporarily decrease due to the difference in ages of the old and new machines, but the average, over the life of the equipment, should be considered.

The changed capital investment will alter the annual charges for depreciation, insurance, taxes, etc.

If the machine is built on a labor saving basis, the plant burden will increase, since all other costs will be pro-rated against a lower labor cost. Management should be prepared for an increase in percentage overhead if extensive use of special machines for labor savings is followed.

The above factors properly evaluated and tabulated will show whether the proposed equipment is a worthwhile investment, and if so the stage is set for actual design layouts. Now the most economical place to correct mistakes in special machine building is on the drawing board. The ideal time for the first design conference is after the first rough layouts are made. Naturally the designer has talked to a number of people in getting ideas to make these layouts but the design conference is called for

(Turn to page 144, please)



Gearshift lever and indicator which are mounted below the steering wheel.

Plymouth Hy-Drive Transmission

SHOWN here is a sectional view of the torque converter, clutch, and transmission combination which is offered as optional equipment on Plymouth cars for 1952. Known as the Hy-Drive, it employs the familiar shift pattern and clutch used with the conventional three-speed transmission, but reduces their use to a bare minimum. The gearshift linkage is interlocked with the starter circuit so that the transmission must be in neutral to start the engine, eliminating any possibility of starting in gear. Once the engine is started, shifting to any gear is accomplished in the familiar manner with the aid of the clutch.

All normal forward driving may be done in third gear. The car may be brought to a complete stop and accelerated without the driver disengaging the clutch, or shifting gears. Additional manual shifting and operation of the clutch pedal are required only when shifting into reverse or one of the lower, high-torque gears.

The torque converter's oil system is combined with that of the engine. A description of this arrangement appeared in *AUTOMOTIVE INDUSTRIES*, August 15, 1952, starting on page 46.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Automation One of
Principal Subjects at
Westinghouse Annual
Machine Tool Electri-
fication Forum. War-
ner & Swasey Opens
New Plant.

Mill Roll Maintenance

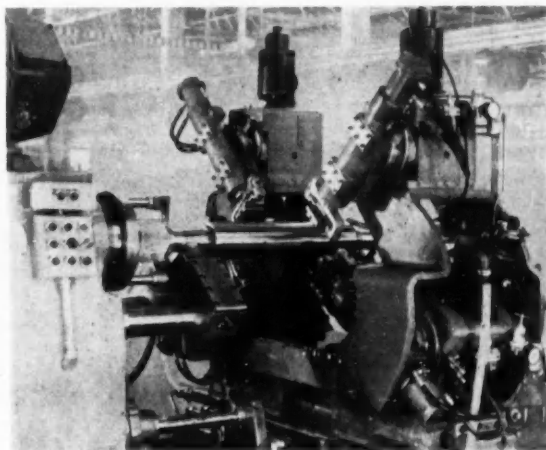
A completely automatic mill roll finisher has been built by Gisholt Machine Co., Madison, Wis., and is currently in use by a producer of stainless steel strip stock. The machine is adjustable to handle a wide variety of mill rolls up to a 20 in. diam and 36 in. roll working surface. Rolls with a single or double crown measuring from 0.001 in. to 0.007 in. can also be handled on the machine. After the rolling mill sent test rolls to Gisholt for Superfinishing, Gisholt engineers found that rolls finished by their process ran $4\frac{1}{2}$ times longer and had 2.8 times more capacity.

For this Superfinishing process, the roll is driven with a special adapter, is supported with a tailstock, and rests on its own bearings. As the roll is driven, the Superfinishing stones contact the work and are oscillated and traversed back and forth over the length of the roll, (see illustration). Three automatic changes of spindle speed give roughing, semi-finishing and finishing operations. At the completion of the cycle the spindle brake is applied, the roll is wrapped to protect the surface, and is then removed from the machine.

New Plant—New Machines

The newly-completed New Philadelphia, Ohio, plant of the Warner and Swasey Co., Cleveland, Ohio, went into operation last month. The plant, costing approximately \$1.5 million and providing 137,000 sq ft of manufacturing floor space, has been added to the company's facilities for the purpose of making parts and minor assemblies which will be shipped to the

This close-up shows four Gisholt Superfinishing heads with bearing support and driving adapter. Stones oscillate and traverse to scrub away amorphous metal.



company's main plant in Cleveland for assembly into complete machines.

At the company's sales conference last month, two new machine models were announced. The first of the models is a single-spindle automatic chucking machine said to be capable of producing parts in larger sizes than any other Warner and Swasey automatic models thus far developed. A small high-speed multiple-spindle automatic machine designed to handle material in bar form up to 1½ in. diam is the other model announced. Both models were designed for the replacement market.

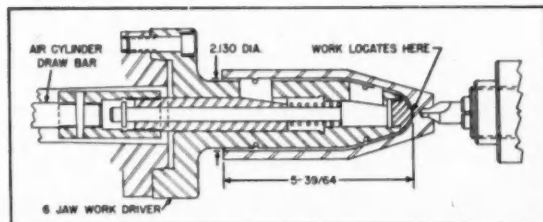
Tungsten Carbide Molds

Carboly Dept. of GE reports that at the Carborundum Co., Niagara Falls, N. Y., tungsten carbide equipped molds are being used in producing

silicon carbide and aluminum oxide grinding wheels from ½ in. to 4½ in. diam. The wear resistant mold inserts are said to be providing an overall average working life about 10 times that of the previously used material. According to the engineers, one four-in. mold on an automatic press produced as many as 86,000 pieces and was still in good condition.

Centering Problem

In order to center forged shells concentric with the bore and to hold center depth in relation to the bottom of the cavity, Seneca Falls Machine Co., Seneca Falls, N. Y., developed a special revolving head for one of its centering machines. In operation, shells are held and centered on a six-jaw, air-operated expanding driver, shown in the line drawing. The three jaws near the open end are positively operated by the air cylinder, while the three jaws located near the bottom of the bore are operated by heavy spring tension to compensate for any variation in the diameter of the rough bore. The work head spindle revolves at slow speed while the center drill revolves at its own drilling speed. (See left). (Turn to page 134, please)



The revolving work head spindle is used on an automatic centering machine made by the Seneca Falls Machine Co., Seneca Falls, N.Y.

NEW

EQUIPMENT

PLANT • PRODUCTION



FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65

Automatic Machine Turns Out 500 Shell Molds per Day

A 12-station unit recently designed and built is said to make approximately 500 shell molds per hour. The machine is automatic, requiring only one man for operation. Pattern size on the standard machine is 28 in. by 22 in.

Beginning at left in Fig. 1, and traveling counterclockwise, a finished shell mold is removed from the pattern. Next, the pattern carriage moves up and engages the sand-resin hopper. Pattern and hopper, clamped tightly together, swing forward to below the horizontal, the material falls on the pattern and the shell mold is formed.

Pattern and hopper now rise, the hopper is disengaged, and the pattern

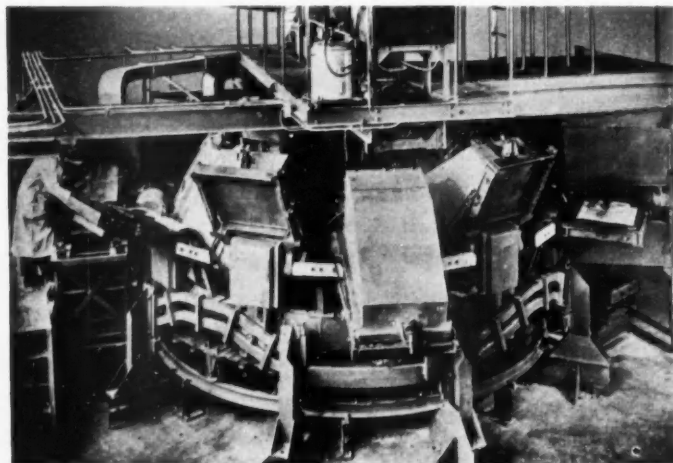


Fig. 1—A single workman attends the machine, which rotates counterclockwise through mold forming, curing, and to finished mold delivery at the left.

carriage, with its soft shell mold, returns to the horizontal and enters the oven. The mold travels through the oven, which is heated with gas-fired radiant burners, and is fully cured when it emerges at the station at the far left of the illustration. Here the mold release pins lift automatically, the mold is removed and the cycle starts again.

As shown in Fig. 2, the automatic proportioning system for sand, resin, and wetting agent is located at the top of the machine. These materials are thoroughly mixed and are deposited in controlled quantity in the hoppers at each revolution of the machine.

Pattern plates may be changed quickly, without stopping the machine, which provides for extreme flexibility of production. The machine may be operated with all patterns producing the same molds, or with twelve different patterns. *Mechanical Handling Systems, Inc.*

Circle E-1 on page 65 for more data

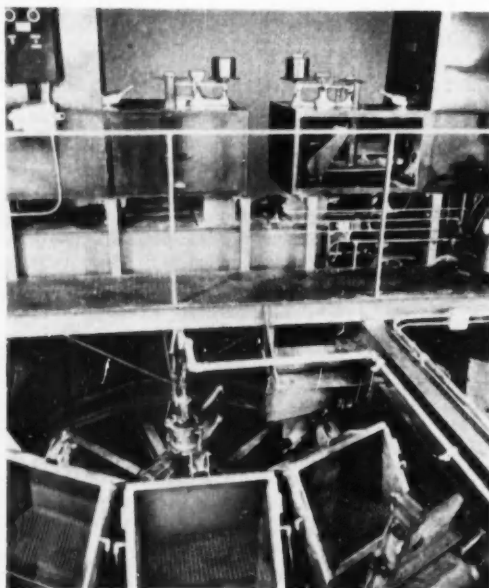


Fig. 2—Automatic proportioning and blending equipment at top of the 12-station shell molding machine.

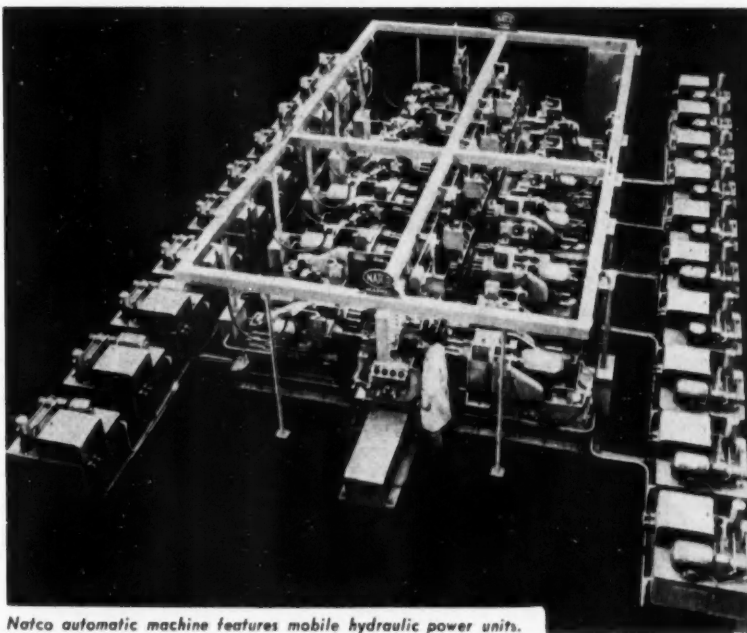
Automatic Processing Machine Completes 102 Operations

The latest Natco Holeway automatic processing machine incorporates new Natco mobile hydraulic power units.

These mobile hydraulic power units are said to comply 100 per cent to JIC standards. The units, shown on the outside of the illustration, provide fast replacement to keep down time to a minimum. They provide quick accessibility for adjustment or repair and lower maintenance cost.

Production on this Natco Holeway is approximately 100 parts per hour. It completes 102 operations automatically on each engine block in 0.6 min including drilling, combination core drilling and counterboring, chamfering combination ream and chamfer, and combination ream and counterbore, trepan and also ream. *National Auto-Tool Co., Inc.*

Circle E-2 on page 65 for more data



Natco automatic machine features mobile hydraulic power units.

Single Ram Broaching Machine for Engine Spider

A combination manual and automatic control setup permits the

broaching of aircraft engine spiders with complete support for the part

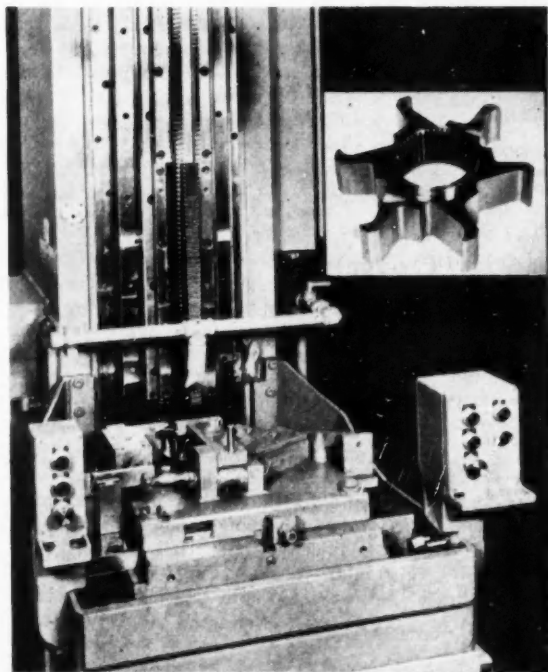
being broached on standard single ram broaching machines.

The machine shown is a six-ton, 54 in. stroke single ram, used to broach six identical contours on the six arms of an aircraft spider.

In operation, the spider is placed in the fixture and clamped in place manually, locating from the splined hole. Each cutting stroke of the broach broaches the contours between one set of arms on the spider. When the circuit is actuated to start the broaching cycle, support jacks in the fixture automatically close in and support the two arms of the spider opposite the surfaces being broached. When the broach has completed the cut, the fixture automatically shuttles clear of the broach and the automatic support jacks are released. This allows the operator—while the broach is returning—to manually unclamp the part and index it in the fixture to the next position for broaching the adjoining set of contours. Then the cycle is repeated until all six contours between the six arms of the spider have been broached. *Colonial Broach Co.*

Circle E-3 on page 65 for more data

(Turn to page 58, please)



Colonial single ram broaching machine. Note the workpiece inset at upper right.

NEW

EQUIPMENT

PLANT • PRODUCTION



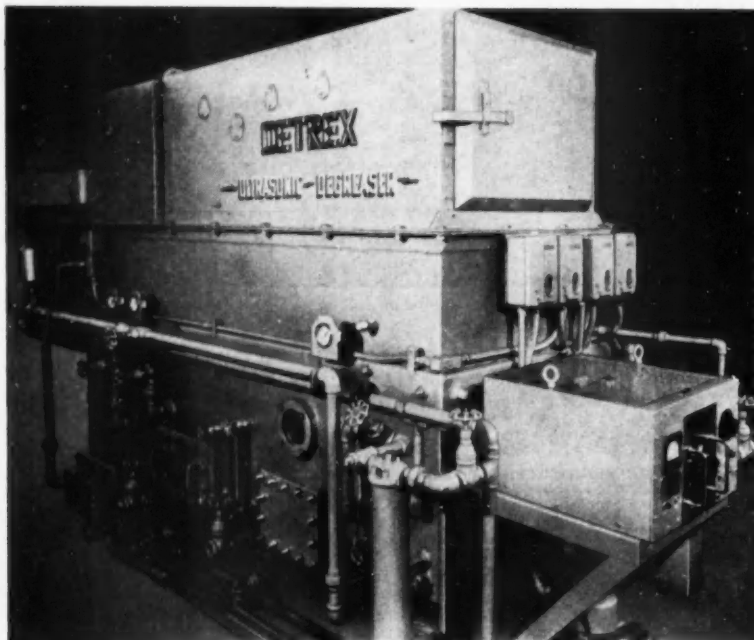
For additional information, please use postage-free reply card on page 65

(Continued from page 57)

Ultrasonic Waves for Metal Cleaning

Development of a method of metal cleaning through the use of ultrasonic

waves has been recently announced. The method, known as the Soni-



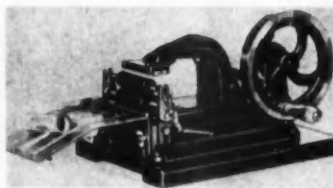
Final cleansing of parts by the use of ultrasonic waves is incorporated in the regular degreasing cycle. The equipment shown here is more than six ft high and 12 ft long. Note high frequency generator at right.

The Cylindaprinter, a small semi-automatic machine for imprinting cylindrical products ranging from small electronic parts like condensers and resistors to two-in. diam tubular casings and containers, has been redesigned and improved. It is used for printing trade-mark designs, part and code numbers, identification data, etc.

Cylindaprinter is now available in two models. Model 55-A handles cylinders with diameters between 3/16 in. and 3/4 in.; Model 55 prints cylinders ranging from 1/4 in. to 2 in. diam. Improved mechanical features

of the unit, says the Cylindaprinter's maker, now enable an unskilled operator to imprint as many as 2000 units per hour with the machine's aid.

In operation the Cylindaprinter imprints the product placed on its



Gottso Cylindaprinter.

Marking Device for Cylindrical Products

Foreign matter adhering to the surface of a jet engine blade is shown here as it is being removed by ultrasonic waves. In this case, the substance is an iron oxide paste which is used to coat the blades to help detect possible flaws and which is difficult to remove by ordinary methods.

clean process, features an element for directing sound energy. The element, jointly engineered by Detrex and the Brush Electronic Co., is a curved piece of ceramic resembling a six-in. long pipe, cut in half along the longitudinal axis. The ceramic pieces, which can be connected in series and arranged as desired, are designed to offer focusing and flexibility properties.

Electrical energy is transmitted to the ceramic transducer, converted into sound energy, and projected through a solvent at a frequency of 430,000 cps. The solvent currently being used is trichlorethylene; however, the process is not limited entirely to this material. Because a potential of only 40 v is required to operate the ceramic transducers, they can be safely immersed directly in the solvent. Detrex Corp.

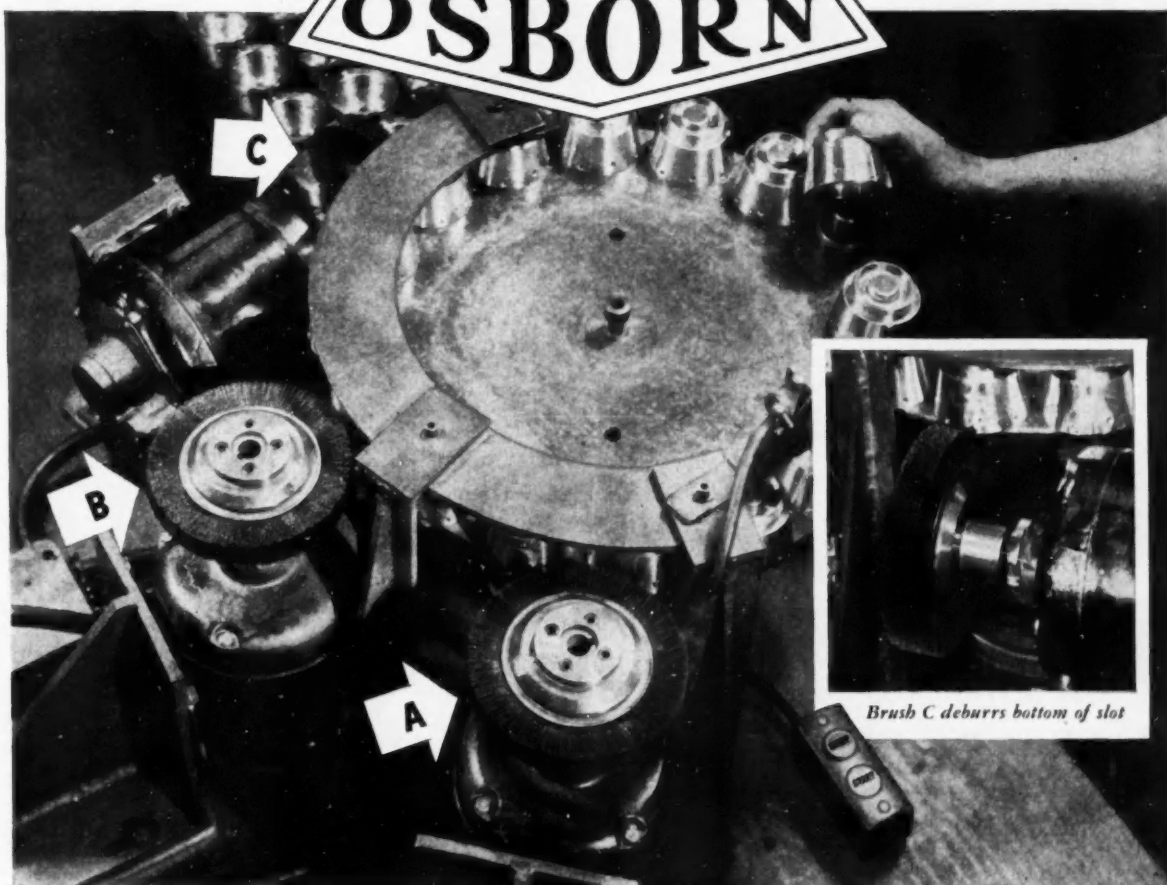
Circle E-4 on page 65 for more data

impression table, ejects it after printing, re-inks the type and restores the printing arm to its original position, all with a single turn of the hand-wheel.

The unit uses rubber type or dies, and inks of almost any color. It is adjustable to accommodate products of different sizes within the maximum-minimum ranges and will imprint cylinders either parallel or perpendicular to the curve. Changeover for new copy, it is said, can be made in a matter of minutes. Adolph Gottso,

Circle E-5 on page 65 for more data
(Turn to page 60, please)

OSBORN



Brush C deburrs bottom of slot

Push-button brushing deburrs 1400 parts per hour

The Problem here was to remove feather burrs from a machined slot in aluminum ammunition components . . . fast. By a hand method, output was only 360 per hour and results were not uniform.

With the help of the **Osborn Brushing Analyst**, the company built the rotating fixture shown above, equipped with three Osborn Master® Wheel brushes. Parts are placed on pins on clockwise-rotating table. Brush A, rotating clockwise, deburrs the corner of one side of slot. Brush B, rotating counterclockwise, deburrs the other side corner. Brush C deburrs the bottom corner. Slots come clean and smooth . . . at a rate of 1400 per hour!

Find out how power brushing can improve your product deburring, cleaning and finishing! Call the **OBA** or write *The Osborn Manufacturing Company, Dept. E-4, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



Brushes A and B deburr side corners.
Brushes rotate at 3450 rpm.

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

AUTOMOTIVE INDUSTRIES, April 15, 1953

NEW EQUIPMENT

PLANT • PRODUCTION



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(Continued from page 58)

Enclosure for Shielding R-F Energy

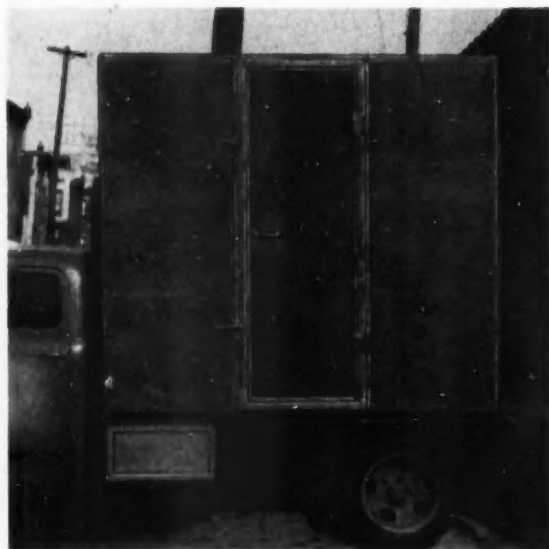
A prefabricated shielding enclosure for the suppression of radio interference is available to the trade. This improved portable unit features solid sheet-copper panels.

Attenuation characteristics of the enclosure, with its single shielding layer, are said to be as good as those of the conventional cell-type room made of copper screening.

The solid enclosure consists essentially of heavy copper sheet panels

joined to rigid copper-plated channels and bolted at all seams, where r-f leakage is further minimized through the use of tensioners. Available eight ft high in eight floor sizes ranging from six by eight ft to 15 by 10 ft, each unit has as optional equipment air conditioning and provisions to accommodate any services such as mechanical or electrical power, water, gas, and air. *RFI Shielded Enclosures.*

Circle E-6 on page 65 for more data

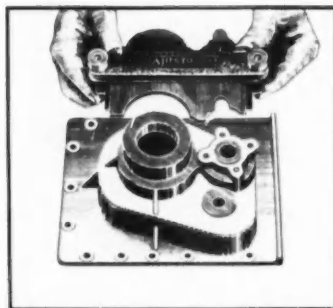


RFI shielded enclosure mounted as a portable unit on a truck.

Profile Template

Both a male and female profile can be obtained with the recently developed *Ajusta* profile template. *Ajusta* is composed of a number of hard brass strips, each one 0.007 in. thick. This is said to permit remarkably close adjustment to practically any profile, and provide extremely close tolerances. (*Toolcraft Manufacturing Co.*)

Circle F-7 on page 65 for more data



Foundry Materials for Shell Molding Process

A four-in-one foundry package of all synthetic materials required for the shell molding process and for traditional sand casting is now available.

Included in this package are two materials essential to shell molding—S-1054, a phenolic resin binder, and SM-55 silicone parting agent to release shell molds from their metal patterns. These, together with G-E 12353 liquid core-binder resin and G-E 3255 Permafil for impregnating porous castings, are said to enable foundries for the first time to obtain all necessary synthetics from a single supplier.



Shell mold bonded with GE S-1054 phenolic resin binder.

S-1054, a two-stage powdered phenolic resin, is said to have optimum properties for binding quality shells. Because it starts melting slowly when the sand-resin mix is dropped on the pattern, it makes possible denser packing, particularly in deep draws, slots, holes and other intricate areas. These dense shell molds turn out castings with less burn-in. In addition, there is less gas porosity due to the reduced quantity of gas-producing catalyst in the resin.

SM-55 is a water emulsion silicone parting agent which presents no fire hazard. It leaves negligible residue on patterns and has improved release properties that permit the use of smaller amounts of silicone, according to the maker.

G-E 12353, third member of the "foundry package," is a liquid phenolic core-binder to enable sand cores to be baked at lower temperatures.

G-E 3255 Permafil is a low viscosity pressure impregnating fluid recommended for sealing porous castings against air and liquid leaks. Castings so treated may subsequently be machined, painted, and used at temperatures up to 150 C with no deterioration of the Permafil seal. *General Electric Co.*

Circle E-8 on page 65 for more data

(Turn to page 62, please)

Is long service life at low cost your problem?

*here's how leading tractor manufacturers
solve it with **NEEDLE BEARINGS***

Many makers of farm tractors specify Torrington Needle Bearings because of their relatively low cost and their long maintenance-free operation under rugged conditions.

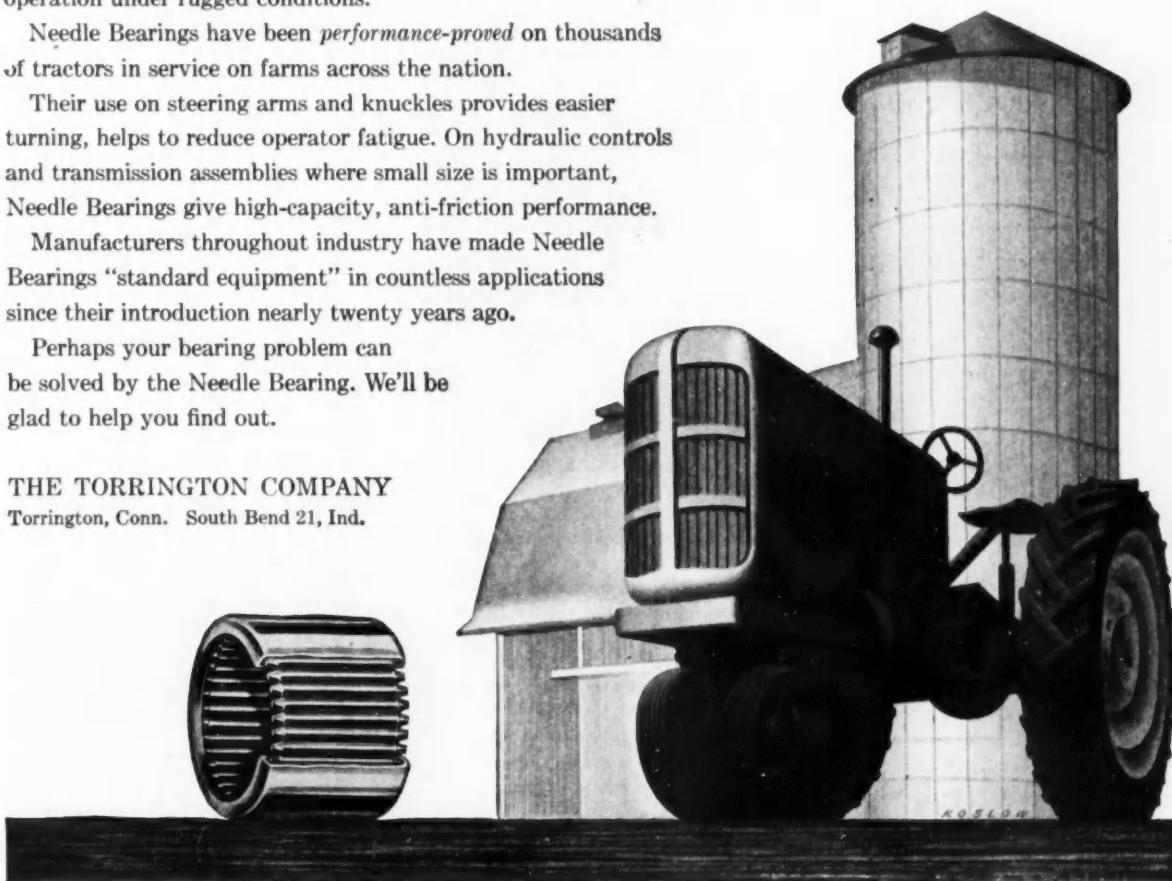
Needle Bearings have been *performance-proved* on thousands of tractors in service on farms across the nation.

Their use on steering arms and knuckles provides easier turning, helps to reduce operator fatigue. On hydraulic controls and transmission assemblies where small size is important, Needle Bearings give high-capacity, anti-friction performance.

Manufacturers throughout industry have made Needle Bearings "standard equipment" in countless applications since their introduction nearly twenty years ago.

Perhaps your bearing problem can be solved by the Needle Bearing. We'll be glad to help you find out.

THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.



TORRINGTON *NEEDLE* BEARINGS

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers



NEW**EQUIPMENT****PLANT • PRODUCTION**

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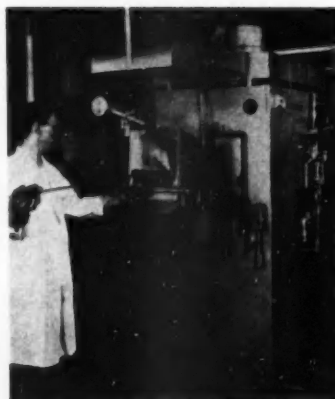
Heat Treating Furnace

Temperatures up to 3100 F can be obtained in a metallurgical heat treating furnace that is now available. A water jacketed chamber, an integral part of the furnace, permits work to be cooled as well as heated in a protective atmosphere. The furnace is designed for use of either hydrogen or dissociated ammonia.

Four manually operated, counter-balanced doors on the furnace separate its charging, heating and cooling chambers. Intended for batch type heating, the work is handled on trays and manipulated by push and pull rods.

The cooling chamber is constructed of welded steel plates to incorporate a water jacketed housing. Ample cooling surface is provided to assure cooling of the charge below the oxidation point before it is discharged.

Heating elements are formed from heavy molybdenum alloy rod into sinuous loops and supported on alundum refractories. The furnace hearth is made of molybdenum alloy to prevent



Westinghouse heat treating furnace.

warpage and provide a smooth, hard surface over which the trays are easily moved.

Protective atmosphere consumption for this high temperature furnace is between 150 and 200 cu ft per hour. Westinghouse Electric Corp.

Circle E-9 on page 65 for more data

Dye Penetrant

Now available is a kit containing recently developed dye penetrant testing material to locate cracks in any solid material. Features include spray can sealing of constituents, for rapid spray application to any part. Spot-check dye penetrant test kits are sold from stock, in a specially designed carrying case.

Cracks show up as bright red lines, and pores or leaks in tanks show as bright red spots. As the Spotcheck name implies, this inspection is best when applied to local areas of large parts, or in remote locations where only a few parts are to be tested. Magnaflux Corp.

Circle E-10 on page 65 for more data



Magnaflux Spotcheck dye penetrant is shown being applied to a punch press frame for maintenance inspection.

Air and Hydraulic Cylinders

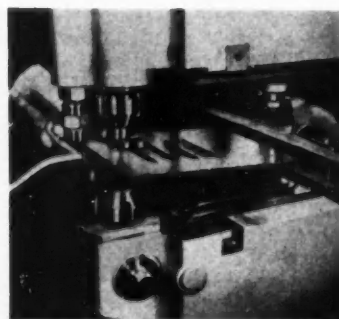
An extensive line of air and low-pressure hydraulic cylinders has been placed on the market. Air cylinders are available in 14 models ranging in bore size from 1½ to six in., operating at 200 psi; and another group ranging seven, eight and 10-in., operating at 150 psi. Low-pressure hydraulic cylinders are available in 14 models ranging in bore from 1½ to five in., operating at 500 psi.

These cylinders are of square type design, available in cushioned and non-cushioned models. Air cylinders feature corrosion resistant, honed brass barrels, designed for unlimited fatigue life at rated loads. Hydraulic cylinders, on the other hand, are provided with barrels of honed steel tubing. Piston seals on both types are leather cups impregnated with synthetic rubber, claimed to be inherently leak-proof. An optional metallic seal type piston assembly is available, utilizing the same rod.

Cushioned cylinders feature the Petch "Floating Cushion" non-critical type cushioning, capable of replacement as a unit. A ball check provides adequate area for the piston return stroke. Petch Mfg. Co.

Circle E-11 on page 65 for more data

Louver Cutting Tool

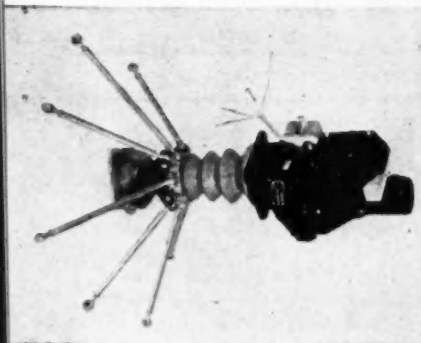


Pullmax louver cutting tool.

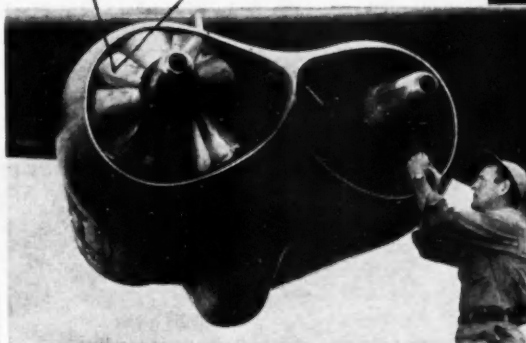
Specialized tools for Pullmax sheet and plate working machines have been designed to cut louvers in steel and non-ferrous metals. This attachment is said to permit the cutting and forming of louvers in a single operation. Although the radius and opening of the louver remain constant, it may be cut to any length. The attachment has a swinging type of female die in the lower section which can be moved to either right or left for the final end forming of the louver. American Pullmax Co., Inc.

Circle E-12 on page 65 for more data

**To assure instant operation
of jet assist engine air intake doors
under icing conditions**



COURTESY LEAR INCORPORATED



COURTESY CONSOLIDATED VULTEE AIRCRAFT CORPORATION

SILASTIC

where other materials fail!



Auxiliary jet engines are fitted with aluminum air intake doors which close to reduce drag when not in use, and open when the engines are summoned for extra bursts of power at take off or in flight.

These doors must always respond to the pilot's instant command on the ground, at sub-zero altitudes or under icing conditions.

This requirement was met by embedding heating elements in a piece of Silastic sandwiched between two sheets of aluminum that are shaped to form the door segments. The Silastic insulates the heating element; withstands surface temperatures up to 450°F, and conducts heat rapidly to the aluminum intake doors.

These doors are opened and closed by means of an actuator

and screw jack assembly. To prevent dirt and ice from fouling the screw jack, exposed sections are encased in a heat resistant Silastic bellows that retains its flexibility at temperatures down to -100°F.

In designing this anti-icing assembly, Silastic proved to be the only material that remained resilient and serviceable after continuous vibration and repeated exposure to temperatures ranging from -100°F to +450°F.

Such performance is typical of Silastic, the Dow Corning silicone rubber. When you need a material that will remain rubbery and retain its excellent dielectric properties after long exposure to temperatures from below -70° to above 500°F, or after prolonged weathering or contact with a variety of hot oils and chemicals, **specify Silastic.**

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NEW

PRODUCTS.

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Magnetic Road Sweeper for Tramp Iron

Now on the market is a magnetic road sweeper, designed to remove tacks, nails, and other tramp iron from highways, parking lots, factory aisles, and airports. Called the Super-Sweeper, it can be pushed, pulled or suspended, and is made in three strengths and four widths: 24, 36, 48, and 60-in. sizes.

The handle is of tubular steel which is easily removed for storage and transportation. The unit's powerful Alnico V magnetic element is said to snap up and hold tramp iron which comes in the path of its sweep.

A loop at the end of the steel handle reportedly can be attached to almost any trailer hitch. The wheels are fitted with puncture-proof 8.00 by 2 tires. Heavy-duty models are said to operate well at speeds up to 10 mph.

By removing the wheels and handle, and attaching with built-in eyebolts, the sweeper can be adapted for use on industrial lift trucks. It has a square aluminum cover, the ends of which are closed with aluminum castings. The entire element is securely riveted together. *Eriez Manufacturing Co.*

Circle P-5 on page 65 for more data



Wheel Block for Trucks and Trailers

Recently introduced is a heavy-duty truck and trailer wheel block made of high strength cast alloy steel. Designed to hold heaviest vehicles and loads with ease, the Casteel block has cast-in holes on the bottom plate to permit nailing to freight car or truck floors, shipping platforms, etc., for blocking of heavy equipment during shipment for long distances.

A wide, curved tread plate reportedly gives greater contact with the

tire and assures even distribution of the load. No sharp corners or projecting surfaces are present to cause accidental cutting or snagging.

Heavy steel gripper teeth on the bottom plate are said to keep the block from creeping or slipping. Provision for hook or chain attachment to the block is made by a hole on the center rib support. Weight of the block is 12 lb. *Calumet Steel Castings Corp.*

Circle P-6 on page 65 for more data



Ignition Alarm for All Types of Vehicles

An automatic, code-operated ignition alarm is known as the Start-O-Code system. It consists of a metal container with a panel holding eight numbered push buttons on one end. Mounted under the dashboard, the unit is connected to the ignition system by flexible metal tubing.

The vehicle is started by depressing buttons of a four-digit code in order to complete ignition circuit. To stop the engine, a release button is pressed. Tampering will disconnect the ignition circuit and sound an alarm—the horn, or a siren. *Victor Devices, Inc.*

Circle P-7 on page 65 for more data



Planetary Gear Reduced Motor

Recently announced is a system of planetary gearing designed to mount directly on the Moto-Mite permanent-magnet, d-c motor. It may be supplied with either a 1/100 hp or a 1/50 hp unit. The planetary is available in 18 different ratios between 17.8 to 1

and 21,808 to 1 with various torques.

The standard unit is available with four-hole flange mounting and 5/16 diameter shaft extension, 1/2 in. long. *Globe Industries, Inc.*

Circle P-8 on page 65 for more data
(Turn to page 122, please)

Free INFORMATION SERVICE

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USE THIS POSTCARD

FREE LITERATURE

Chuckling Grinder

Recently released is a circular on a vertical chucking grinding machine available in six sizes to meet requirements on larger sizes of work. Requests for copies should be made on company letterheads directly to the manufacturer as follows: *The Bullard Co., Bridgeport 2, Conn.*

Bag Handling

Currently offered is an eight-page booklet entitled "The Logistics of Bags." It describes and pictures the handling cycle of bags from receiving, through processing and shipping. *Elwell-Parker Electric Co.*

Circle L-1 on postcard for free copy

Water Brake Instrument

Bulletin WA-1000 describes the Hydra-Brake, an advanced water brake instrument for high-speed rotary power absorption. Models with various speed vs load characteristics are available to fulfill numerous needs. *Industrial Engineering Co.*

Circle L-2 on postcard for free copy

Fastener Problems

Details of how a wide variety of design problems were solved with self-locking fasteners are contained in a 32-page booklet now available. *Elastic Stop Nut Corp. of America.*

Circle L-3 on postcard for free copy

Boiler Tubing

Recently issued is a data card (TDC-137A) to aid in the purchase of welded carbon steel boiler tubing or the estimation of cost of equipment using this material. *Tubular Products Div., Babcock & Wilcox Co.*

Circle L-4 on postcard for free copy

Photoelectric Recorder

Bulletin GEA-5536 on photoelectric recorder applications is now available. It describes applications of the recorder with metals, fatigue, research, etc., testing equipment as an aid in the detection of pipeline corrosion, development, machinability, testing, etc. *General Electric Co.*

Circle L-5 on postcard for free copy

Silicone Varnish

Now available is a preliminary data sheet on No. 997 varnish, a silicone dipping and impregnating compound for Class H insulation. *Dow Corning Corp.*

Circle L-6 on postcard for free copy

Magnetic Chucks

Recently issued is a circular (Form No. MC-2) on Power-Grip magnetic chucks for milling and grinding. *Magnetic Products Div., Sundstrand Machine Tool Co.*

Circle L-7 on postcard for free copy
(Please turn page)

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4/15/53

FREE LITERATURE	NEW PRODUCTION & PLANT EQUIPMENT		NEW PRODUCTS	
L-1 L-7 L-13 L-18	E-1 E-7 E-13 E-19	P-1 P-7 P-13 P-19	P-25	
L-2 L-8 L-14 L-20	E-2 E-8 E-14 E-20	P-2 P-8 P-14 P-20	P-26	
L-3 L-9 L-15 L-21	E-3 E-9 E-15 E-21	P-3 P-9 P-15 P-21	P-27	
L-4 L-10 L-16 L-22	E-4 E-10 E-16 E-22	P-4 P-10 P-16 P-22	P-28	
L-5 L-11 L-17 L-23	E-5 E-11 E-17 E-23	P-5 P-11 P-17 P-23	P-29	
L-6 L-12 L-18 L-24	E-6 E-12 E-18 E-24	P-6 P-12 P-18 P-24	P-30	

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Quality Control

Vol. 1, No. 1 of "Greer Topics" contains a feature article on the use of the manufacturer's test machines for quality control at the Aircraft Gas Turbine Div. of Westinghouse Electric Corp. *Greer Hydraulics, Inc.*

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Welding Head

Bulletin No. 307-10 covers a rotating upper stitch welding head to fit any electric resistance welder. *Sciaky Bros., Inc.*

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Nickel Plating

Ready for distribution is a technical data folder on the Kanigen nickel plating process that is said to require no electrical equipment. *General American Transportation Corp.*

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Die-Cast Zinc Cleaner

Now available is a folder describing how anodic conditioning with Composition No. 95 improves the efficiency of the preparation of zinc-base die castings for plating. *Oakite Products, Inc.*

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Dynamometer

Bulletin D4 describes Model AN dynamometer for measuring traction, tension, or weight. *W. C. Dillon & Co., Inc.*

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Alloy Steel

Now ready is a brochure on Carilloy FC, a free-machining grade of pre-hardened alloy steel. *U. S. Steel Supply Div., U. S. Steel Corp.*

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Milling—Centering Units

Recently released is a circular on a line of milling and centering ma-

chines. Specifications are given. *Motch & Merryweather Machinery Co.*

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Exhaust Valve Materials

Vol. 14, No. 1 of "Engineering Forum" is devoted to an article on "Some Significant Properties of Exhaust Valve Materials." *Eaton Manufacturing Co.*

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Carbide Tools

Ready for distribution is a 56-page catalog on a complete line of carbide blanks, tools, and tool holder inserts with 12 pages of technical information on carbide and its use. *Vascoloy-Ramet Corp.*

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Seamless—Welded Tubing

Now available is a brochure on Ostuco tubing for seamless and welded applications. It shows shapes to which tubing may be forged and fabricated. *The Ohio Seamless Tube Co.*

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Pumping Problems

Recently announced is a 36-page handbook entitled "How To Solve Pumping Problems." Charts and data relating to the application of pumps are included. *Pump Div., Geo. D. Roper Corp.*

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Conveyor Belts

Ready for distribution is a 135-page catalog on woven wire conveyor belts for the conveying and treatment of industrial products. *The Cambridge Wire Cloth Co.*

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Dust Collector

Bulletin No. 915 describes Type CH-3 self-cleaning cloth screen dust collector. *Pangborn Corp.*

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Lead-Bearing Steel Bars

Bulletin No. 8 on LA-LED free-machining, lead-bearing steel bars has been published. *La Salle Steel Co.*

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(See preceding page)

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THE Auer REGISTER COMPANY 4600 CLEMENT AVENUE, CLEVELAND 5, OHIO

March 12, 1953

Continental Screw Company
New Bedford, Massachusetts

Gentlemen:

This is to inform you of the very gratifying results which we have experienced since using your Holtite taped screws in our operation.

It is necessary to supply two installation screws with each of our units, and we had for many years been packaging them in small cloth bags secured with a tie-string. A considerable saving was experienced when we substituted a kraft envelope for the cloth bag. The advantages realized by subsequent conversion to Holtite taped screws are obvious when you examine the following table of costs:

Packaging		Total	
Unit		Labor	
Bag	\$8.75M	\$2.40M	\$11.15M
Envelope	1.90M	2.05M	3.95M
Taping	.90M	-0-	.90M

This table tells a story, and it is indeed a good one. However, it does not point out the many errors of mixing and improper selection which taped screws have eliminated in our own handling.

We sincerely appreciate the personal touch and follow-up which are characteristic of Continental in supplying us with a product unsurpassed in quality.

Yours very truly,

THE AUER REGISTER COMPANY
R. E. Brumbaugh
Secretary

You too can count on Continental.



Manufacturers of **HOLTITE** Fastenings For Every Purpose

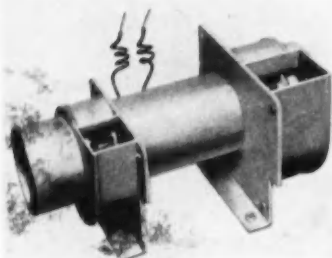
CONTINENTAL SCREW COMPANY, NEW BEDFORD, MASS., U. S. A.

NEW



AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65



Howard Model 100 motor blower.

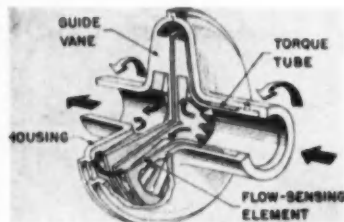
Motor Blower

Now available is a fractional horsepower motor blower for aircraft. Model 100 dc motor is rated 1/50 hp at 27½ v. It operates at 4500 rpm at sea level, 6500 rpm at 50,000 ft with a relatively constant air delivery of 40 cfm. Temperature range is -65 C to 70 C. Howard Industries, Inc.

Circle P-1 on page 65 for more data

Mass Flowmeter

An instrument said to be capable of measuring the true mass rate of flow of anything that will flow or fall through a pipe has been announced. It responds to pounds and is totally insensitive to volume.



Control mass flowmeter.

Direct reading measurements in terms of pounds per minute, or with integration, pounds reportedly can be made of gases, liquids, slurries, or particles in an air stream, all with the same instrument. Accuracy is inde-

pendent of volume, temperature, pressure, viscosity, compressibility, or external accelerations.

It is claimed that the unit may materially add to airline safety, as a small one with an integrator will tell the pilot exactly how much fuel he has left. The measurement, it is stated, would not be affected by temperature or viscosity. It also could eliminate the need for weighing tanks in the testing of aircraft engines.

The principle of operation is based on the measurement of the torque necessary to give the flowing mass a Coriolis acceleration. This torque is reportedly dependent only on the dimensions of the flowmeter, a rotational speed, and the mass flow with no volumetric troubles.

The manufacturer states until flow rates and sizes can be standardized, the unit will be custom built for the job. Industrial and military needs will be met first, so that general use of the instrument can only be contemplated. Control Engineering Corp.

Circle P-2 on page 65 for more data

Desiccator

Type B-1A desiccator, now available, pumps and de-humidifies air in closed system to prevent frosting or fogging of dome lens of vertical periscopic bombsight of aircraft. Air is said to be sucked through the pump, forced through the desiccant jar, and repeatedly returned to the bombsight lens dome in a renewed dry state.

Desiccant jar contains a breather which replenishes with dry air any loss in the otherwise closed circulating system. Color indicates approximate relative humidity as adsorption progresses. Danger line is indicated on jar.

The pump is oil-free, so no oil vapor reportedly is contained in the discharge. Rotor, liner and sliding blade are self-lubricating, built integrally with, and driven through direct drive of the motor.

Motor is 1/50 hp, 27 v, d-c, 1.5 amp, continuous duty, enclosed explosion-proof type. It is said to have useful brush life and motor life of 500 hours at 40,000 ft. Electrical circuit contains radio interference filter with AN 3102 receptacle connector to power source. Desiccators are also available with 115 v, a-c, 400 cps motor. Romco Div., Lear, Inc.

Circle P-3 on page 65 for more data



Twelve-Point Fastener

Fasteners

Precision-forged, threaded 12-point aircraft type fasteners in ferrous, non-ferrous, and precious metals, in standard diameters and lengths, are now being marketed. These non-slip type fasteners are said to be designed to permit higher torque loads and to accommodate the standard 12-point socket or box type wrench.

The fasteners reportedly have heads designed to provide a "non-slip grip" to eliminate wrench slipping. Special diameters and lengths are available. Twelve-Point Fastener Co.

Circle P-4 on page 65 for more data

CHROME

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FULL-FLOW RING SETS



- 1 Top compression ring of chrome-alloy cast iron has solid chrome face, factory-lapped to a light-tight finish, with sides Granosealed for greater flexibility.
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- 3 All rings in Sealed Power KromeX Ring Sets are beveled or tapered to threadline contact for quicker seating and blow-by control.

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The BUSINESS PULSE

Nonagricultural Employment About 10 Million Higher Than at the Peak of World War II and Some Five Million Greater Than in the Months Just Before Korea. Sharp Rise in the Awarding of Heavy Construction Contracts.

This Survey Is Prepared
Exclusively for AUTOMOTIVE
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Business Pattern

There has been virtually no change in the pattern of business during the past month, despite the death of Joseph Stalin and the additional uncertainty which now characterizes relations between the East and the West. In the absence of present knowledge regarding the policy intentions of the new Soviet leadership, the business community apparently is acting on the assumption that the "cold war" will continue pretty much as it has done in the past.

Business is remarkably good at present, and there is general confidence that it will continue so in the months immediately ahead. The sharp recent upswing in durable-goods output has carried the over-all level of industrial production to a new postwar high, and manpower and materials supplies are being taxed almost to capacity. At the latest official tabulation, nonagricultural employment was running roughly 10 million higher than at the peak of World War II and some five million greater than in the months immediately preceding the outbreak of the Korean war. In some areas, most notably in and around the automobile-producing center of Detroit, marginal labor is becoming increasingly hard to recruit, and employers are finding it necessary to campaign extensively to attract new workers.

The all-important steel industry shows no letup in the pace of operations. Final figures for March, not available at this writing, probably will show that ingot production exceeded 10 million tons for the first time in the nation's history. Even so, the shortage of many finished items still is acute, and durable-goods producers, led by automobile and appliance makers, are pursuing all leads in their search for supplies. Increased amounts of steel are reportedly being pur-

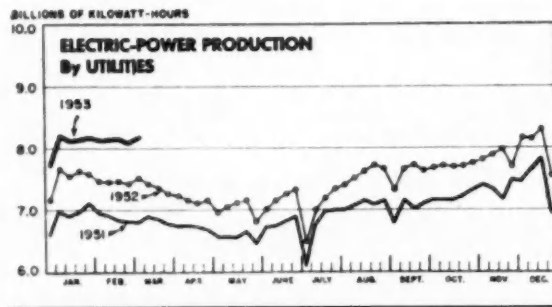
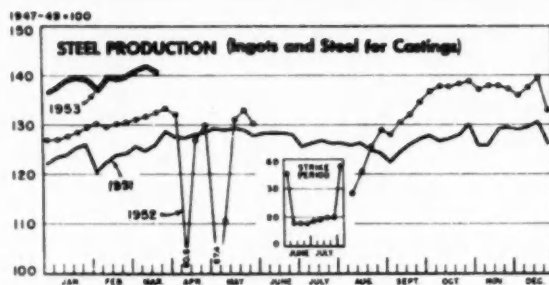
chased from abroad at premium prices, and high-cost conversion contracts are being extended beyond mid-year.

Construction at High Levels

Activity in the construction industry is also being maintained at remarkably high levels, the decline from last year's summer and fall peaks having been considerably less than seasonal. During the first two months of the year, construction expenditures totaled \$4.5 billion, six per cent higher than in the comparable period of 1952, although only one per cent higher in terms of physical volume. Perhaps more significant from the standpoint of the near-term future is the

(Turn to page 148, please)

Selected Business Indicators



Source: U. S. Dept. of Commerce

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GIBSON -
RAYMOND**
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COOK
PLANT**
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MICHIGAN

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AND SONS CO.**
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CONNECTICUT

**OHIO
DIVISION**
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DAYTON, OHIO

**DUNBAR
BROTHERS
COMPANY**
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**MILWAUKEE
DIVISION**
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435 E WASHINGTON BLVD.
LOS ANGELES 15,

top 10
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AIR BRIEFS

By ROBERT McLARREN

Jet Transport

Assuredly the postwar decade will go down in the history books as the period of the U. S. jet transport travail, for every week brings with it a claim and counterclaim by industry, airline and Government officials concerned with the problem. Eastern Air Lines' "Captain Eddie" Rickenbacker says: "No suitable jet-powered transport with adequate capacity, range and efficiency characteristics is yet available." Lockheed reveals that its designers have completed no less than 300 preliminary designs for a jet transport since the first one in April, 1945—and this figures out to one new jet transport design each week. Fred B. Lee, Acting Administrator of Civil Aeronautics, told the Airport Operators Council that the takeoff acceleration of a jet transport is low and its early climb flat, that its pilot cannot quickly detect a failure of one of the engines, that stopping of jet transports is difficult and that power variations with temperature and humidity are twice as large as those for piston engines. Edward C. Wells, Boeing vice-president-engineering, speaking on the same program, said: "Special problems envisioned in relation to takeoff and landings do not appear to be on the horizon." He believes that the jet transport will actually have very good takeoff characteristics and that landing approach paths will be at least as good as those required for today's airliners. And so the period of gestation goes, a long suffering against the final day when the U. S. has its first jet transport.

Pat Hands

Meanwhile, Lockheed and Douglas show increasing signs of pitting their famed Constellation and DC-6/7 transports against the Comet in this opening round of international competition. The Lockheed R7V-1, Navy transport version of the Super Connie, recently took off at a gross weight of 145,000 lb, or 7½ tons more than its normal operating weight as a proof-test of its abilities. Douglas plans to have its new 400-mph DC-7 transport flying by the time you read this. Both huge transports will rely on their very long non-stop range to make up the time lost by the Comet in frequent refueling stops on inter-continental and trans-ocean routes, and both Lockheed and Douglas have figures to prove their transports can beat the Comet from London to South Africa. Even stronger is their argument that their airplanes can do the job at less than one-half the cost per passenger. Neither

expects really serious jet competition until 1957, by which time both should have their own jet answers flying.

Investigations

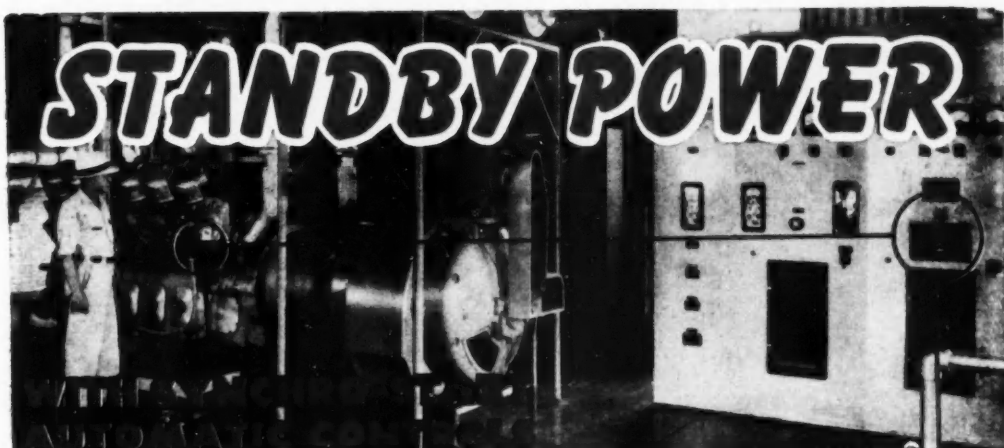
Next round in the aviation investigation story will be fought by Senator Styles Bridges and his Senate Armed Services Investigating Subcommittee. First on the agenda will be the perennial probe of the Kaiser-Frazer Corp. and the fact that its Fairchild C-119 Packets cost one million dollars each while the same plane built by its parent Fairchild Aircraft Division costs only \$265,000 each. (Meanwhile, Fairchild production on the C-119 is approaching an end and the company has signed contracts for F3H tooling with Temco and B-52 wing and tail fabrication for Boeing.) Also on the Bridges agenda are a look into the USAF policy of dual sources of supply for everything (which created the Kaiser-Fairchild contract simultaneously with Kaiser's existence as the source of supply for the Chase C-123, a companion airplane of the C-119) and the general problem of the aircraft production program.

Kaiser Expands in Aviation

Consolidation of Kaiser-Frazer and Willys-Overland would provide a variety of important additions to Kaiser's growing aviation industries. Currently, Kaiser, in addition to building Fairchild C-119's at Willow Run and preparing to build his Chase C-123, builds B-52 parts at San Leandro, Calif., Lockheed P2V parts at Richmond, Calif., Wright R-1300 engines at Dowagiac, Mich., electronic equipment at Nashua, N. H., and parts for Republic F-84 and Martin B-57 planes at Bristol, Pa. Acquisition of Willys would add landing gears for the Packet and the Beech T-36A, major assemblies for the General Electric J47 turbo-jet engine, a variety of radar and electronic equipment, forgings for a dozen aircraft manufacturers.

Monster Job Ahead

The aircraft manufacturing industry started 1953 with a backlog of \$17.6 billion worth of aircraft, engines, propellers and other products, to reach a new postwar high. Thus, despite the enormous expansion of production begun in 1950, the industry still is being loaded up more and more heavily with orders. This huge backlog is made up of \$11 billion worth of com-
(Turn to page 76, please)



"Installation at LEBANON, OHIO, for the TEXAS EASTERN natural gas pipe line."

The need for automatic standby power has increased from year to year due to the vast savings they have afforded. Now, with the imminent possibility of bombing our cities and disrupting essential services, the need has greatly increased and deserves serious consideration by all power users.

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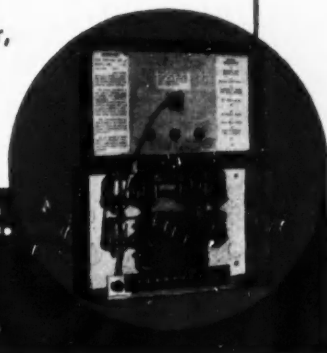
The above picture is typical of the many thousands of other SYNCHRO-START automatically controlled standby power plants that are in use throughout the world under every conceivable power requirement; on land, sea, in the air, and in the mines.

Contact your Architect, Engineering Firm, Engine Dealer, or Engine Manufacturer, for further information, or write us about your needs and our nearest representative.

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Automatic Engine Control Equipment

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Driveshafts for Mack Trucks and Buses Balanced to

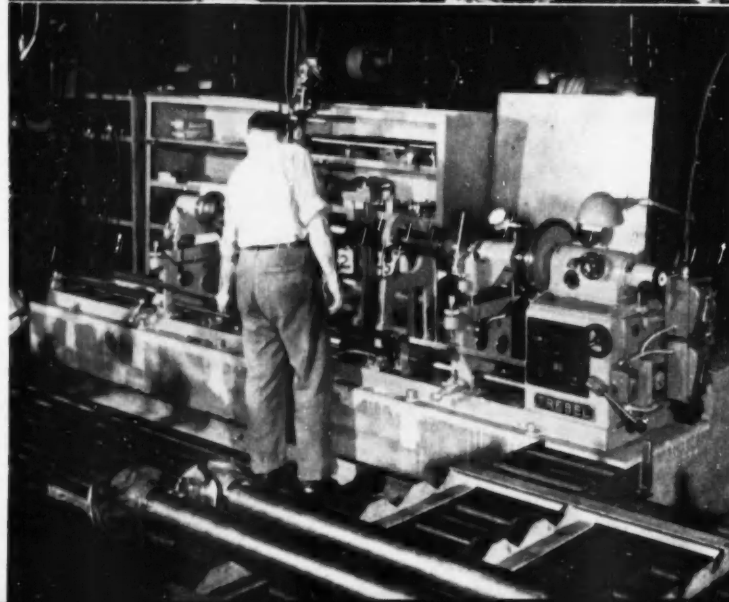
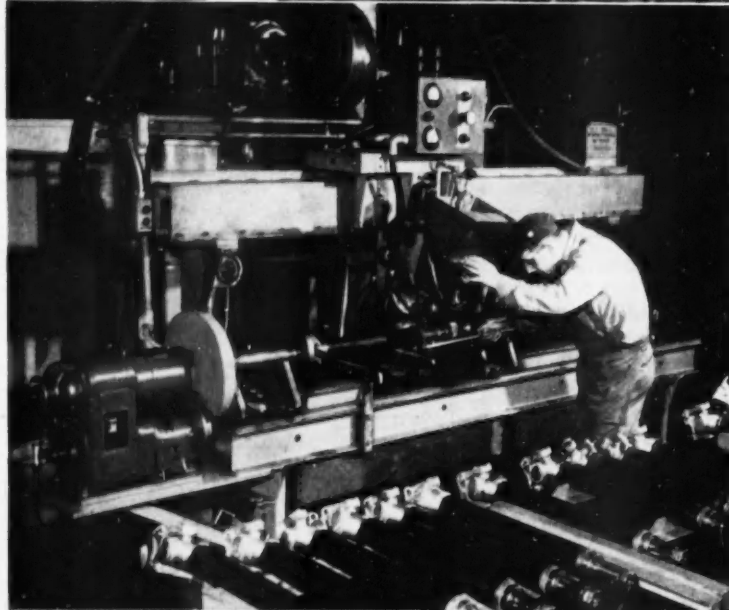
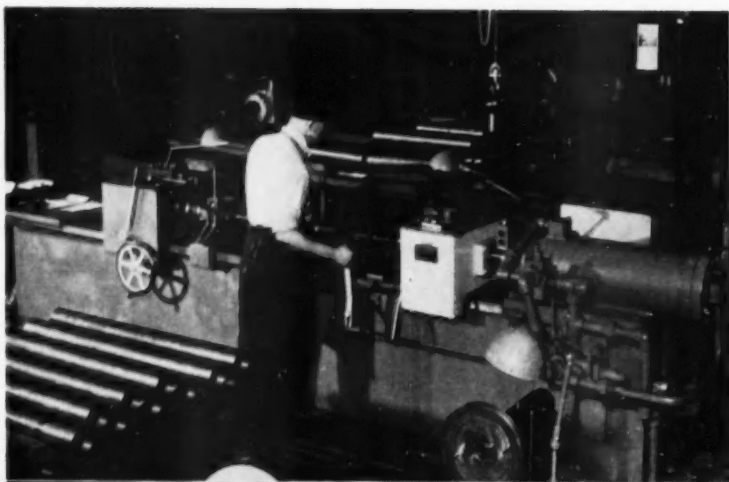
Close Tolerances

By Thomas Mac New

VERSATILITY, instead of mass production techniques, is utilized on the line at the Mack truck plant at Allentown, Pa., for the production of a variety of driveshafts for Mack trucks and buses. With the unique set-up established by Mack engineers recently, driveshaft inspection costs have been greatly reduced and returns from the field have been practically eliminated.

Although the average shaft made is 72-in. long and weighs approximately 133 lb, shafts up to 88-in. long have been made with little or no special set-up time required. Currently, two different diameters — three in.

(Turn to page 108, please)

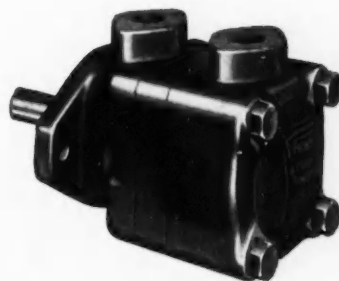


Top—At this station the tubing is lined up with the spline stub and the universal joint, and the units are pressed into place by the Williams, White Co. 25-ton horizontal hydraulic press. Tubing is carried to the work station of the press by gravity conveyor.

Middle—After the universal joint and spline stub are pressed into the tubing, this automatic, submerged arc welding machine of Mack's own design welds the component parts into place. The machine utilizes a Reeves drive, a Lincoln automatic arc welding head, and an invincible flux recovery unit.

Bottom—Final operation along the line is performed by the Trebel balancing machine. In this illustration, the operator is locking the left nodal bar of the machine for balancing the right-hand end of the driveshaft.

Series M2-300 Vickers Hydraulic Motors made in three sizes with 3 styles of mountings.



Series M2-200 Vickers Hydraulic Motors made in two sizes with 2 styles of mountings.

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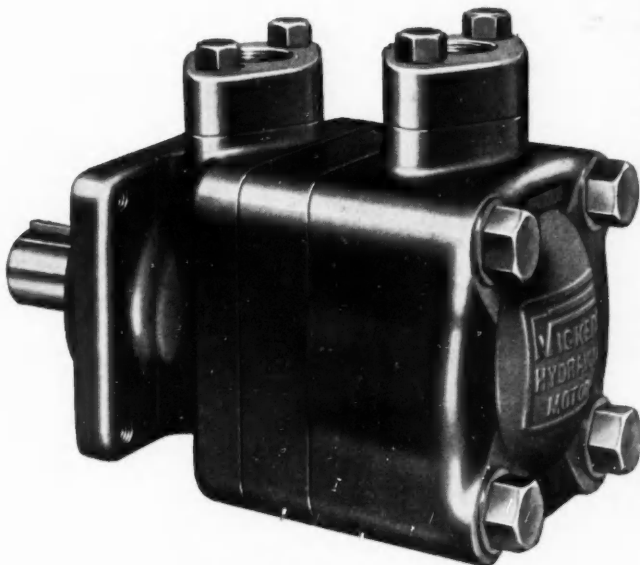


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**BALANCED VANE TYPE
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MOTORS**



Series M2-500 Vickers Hydraulic Motors made in two sizes with 2 styles of mountings.

Now in production are two more series of Vickers Balanced Vane Type Hydraulic Motors. They are now available in nine sizes and have normal horsepower ratings to 28.5 hp. Among the important features of these simple and rugged hydraulic motors are: (1) more horsepower for less money, (2) hydraulic balance for longer life and less maintenance, (3) automatic wear compensation, (4) dynamic balance and quiet operation, (5) exclusive "rocking beam" construction. Get in touch with your nearest Vickers Application Engineering office for further information; ask for new Bulletin M-5103.

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Write for NEW Bulletin M-5103

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

AIRBRIEFS

(Continued from page 72)

plete airplanes (including missiles) and parts, \$5 billion in aircraft engines, \$300 million in propellers and \$1.3 billion in other products and services. Significantly, the great bulk of this backlog is for the military, which has obligated 93 per cent of the aircraft, 96 per cent of the engines and 90 per cent of the propellers, making it unmistakably clear

that the aviation business is a military business pure and simple.

Navy Fighters for Korea

The Navy has scheduled both the North American FJ-2 and Grumman F9F-6 swept-wing carrier fighters for Korean action. The FJ-2 is the Navy version of the famed F-86 Sabrejet and differs only in details. The F9F-6 is a swept-wing version of the well-known F9F Panther, the first Navy jet to see combat. Speaking of the new Grumman Cougar,

Vice Admiral Ofstie, Deputy Chief of Naval Operations for Air, says that it has performance "substantially the same as the Russian MIG." However, neither of the new types are expected to tangle with any MIG fighters since Navy carrier aircraft operate only off the southeast coast of Korea on ground support missions and none ever get up to "MIG Alley" in the northwest.

Cargo Lines to Merge


Two bitter but mutually-profitable enemies have agreed to merge. Slick Airways and Flying Tiger Line, the nation's two largest all-cargo airlines, have agreed to merge into a single cargo line that will make the resulting company the fifth largest airline in the U. S. Both lines were formed shortly after V-J Day and both have energetically and soundly built their air freight businesses into basic components of an entire segment of American industry. The merger will permit the two companies to combine operations at numerous airports around the nation and afford economies. Flying Tiger Line will emerge as the surviving company through an exchange of its own stock plus a new stock issue for the \$6,750,000 in outstanding stock of the Slick interests. The merged company will operate a fleet of 71 all-cargo multi-engine transports and is expected to perform \$45-\$50 million worth of business annually.

Production Exceeds Losses

In the last three months of 1952, military aircraft production exceeded all of the losses of U. S. aircraft in Korea since the war began, according to former USAF Secretary Thomas K. Finletter. Writing in the semi-annual report of the Secretary of Defense for the period July 1-Dec. 31, 1952, Finletter revealed that the USAF had doubled its size from 48 wings to 100 and its personnel from 410,000 to 957,000 in the 30 months since the start of the Korean war. He says that twice as many airframe factories are now in operation as before Korea and more than a thousand additional sources of aircraft parts and equipment have been developed. Finletter announced: "Aircraft deliveries have quadrupled in two years; they will climb only slightly during the next few months, then will level off at a rate which will complete the equipment and maintenance of the 143 wings authorized by mid-1955."

(Turn to page 78, please)

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with the modern
neutral stabilizer

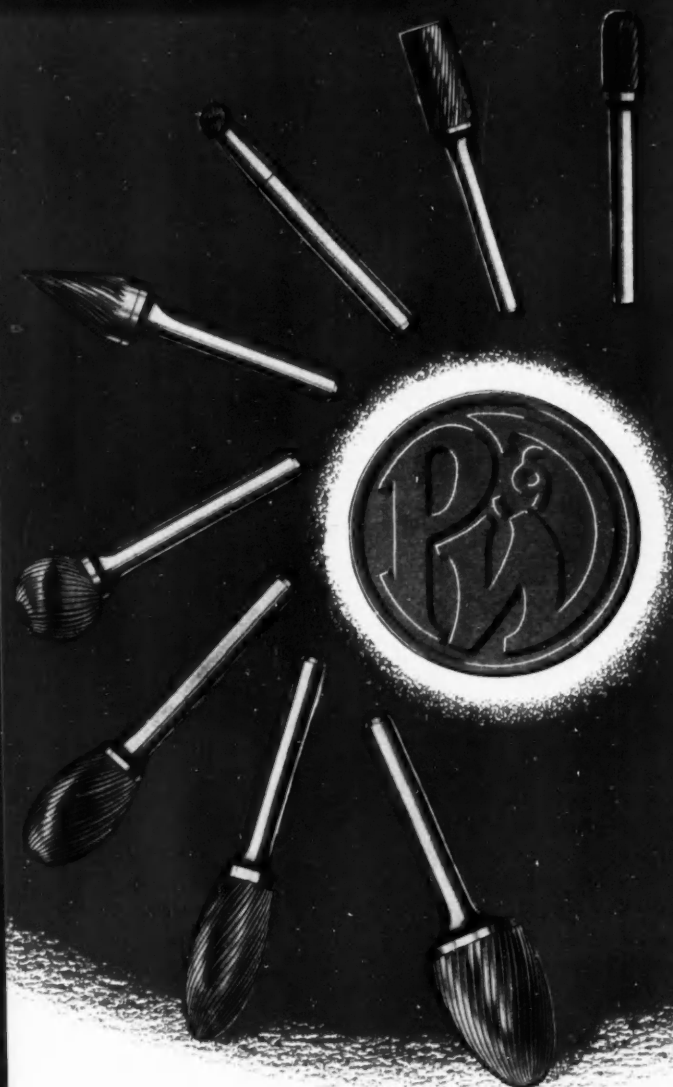
The solution to your solvent problems . . . the most modern solvent for high stability in vapor degreasing of metal parts. Contains a mixture of entirely new and different stabilizers that prevent solvent breakdown and possible acid formation. Blacosolv is the one solvent for all metals or combinations of metals. Does not affect or stain any metal . . . easily distilled and reclaimed from oil and impurities . . . the most economical solvent that assures better production and higher stability.

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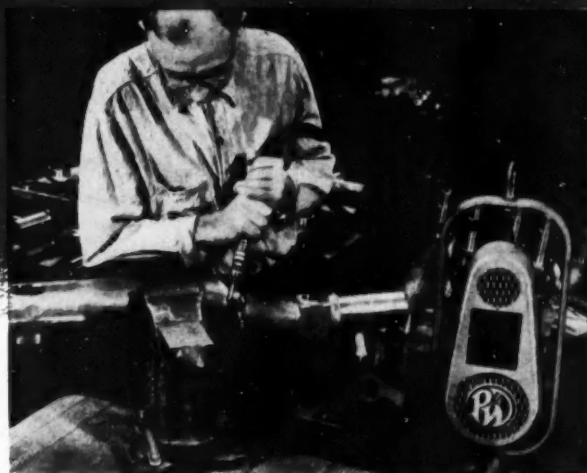
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AIRBRIEFS

(Continued from page 76)

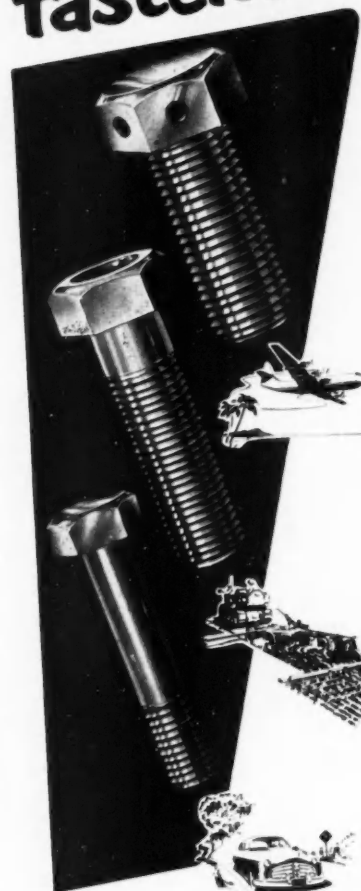
Serious Labor Trouble

There are strong indications that the current strike of workers at the General Electric jet engine plant at Evendale (Cincinnati), Ohio, will be a long one for a variety of reasons. General Electric has flatly refused to give any consideration whatsoever to a union shop in the plant, while both the UAW and IAM are equally adamant on the issue. Confusing the problem is the jurisdictional fight between the two unions which has caused great bitterness at the plant. Also confused is the Federal Mediation and Conciliation Service authority and scope at the moment. Fortunately, the Evendale plant is far, far ahead of schedule on its supply of J47 jet engines to the Air Force and shortages in this engine will not be felt for some months. Only certain solution at the moment appears to be Government seizure of the plant, a particularly unpopular White House move at this critical period in the new administration.

Twin-engine Utility

The strong, rising trend of the lightplane industry towards the four place airplane, culminating in delivery of some 90 per cent of output last year in this size, has now moved quickly into the twin-engine field. This year is expected to see the entry into production of a wide variety of twin-engine, four-place aircraft. Leading the field at the moment is the twin-engine Navion developed by Riley Aviation in Florida. Starting as a hobby, Riley converted the popular single-engine, four-place design into a twin-engine model and sales increased so rapidly that Temco Aircraft has signed a contract to produce 500 of the type. Also available this year are the Cessna 310, using two Continental 225-hp engines, the Piper PA-23, using two Lycoming 150-hp engines, and a new Mooney design. Designed expressly for the "corporate aircraft" market, these new "twins" are expected to create virtually a new class of aircraft in between the popular 2-4-place "utility" types of the past and the big twin-engine light transports represented by the Beech 18.

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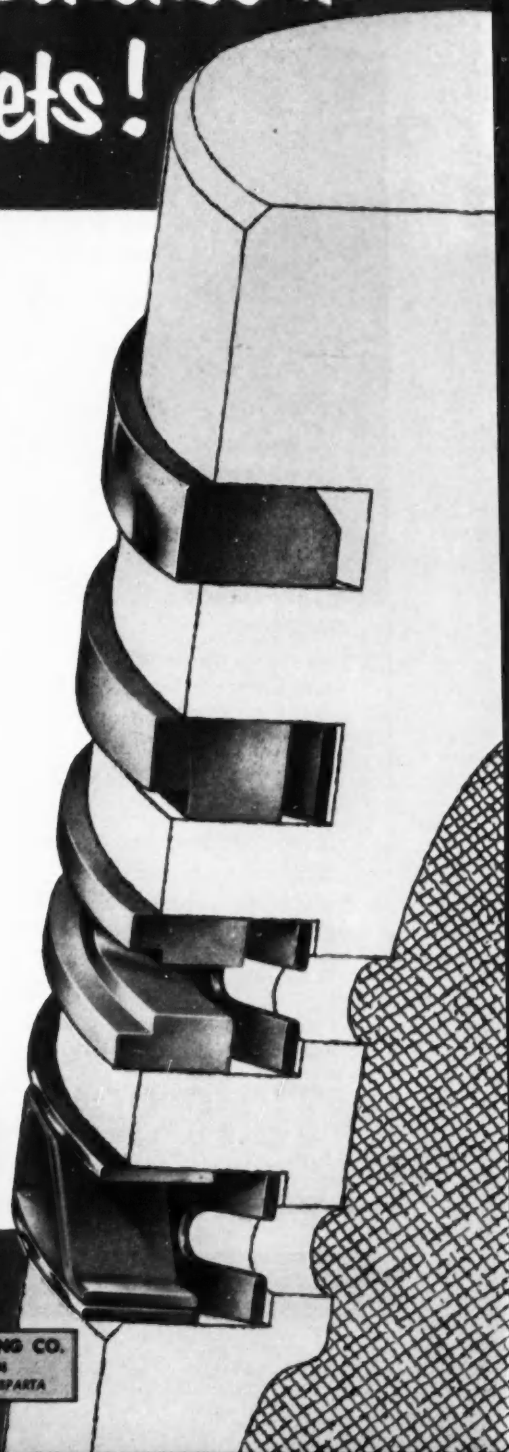


Inside Bevel Chrome Compression Ring . . .

Alloy iron ring with pre-seated chrome surface on face. Chamfered upper inside corner imparts twisting action to produce positive bottom edge contact with cylinder wall to seal compression and blow-by. Precision lapped for immediate seating and elimination of scuffing. Type IB-CR

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ASTE Annual Meeting

(Continued from page 44)

plish the same purpose without objectionable stress concentration is shown in view (B). In many cases where space is very limited, it is sometimes impossible to avoid all stress concentrations but, wherever possible, they should be avoided because they shorten the life of the mounting.

Controlling Machine Tool Down Time

By Ralph E. Cross
The Cross Co.

Industry in the past few years has been devoting more and more atten-

tion to machine tool efficiency. In a survey conducted by the ASTE in 1952, machine tool users declared overwhelmingly that they wanted improvements in machines that would reduce down time. Today, we are hearing too many reports from production executives that go something like this, "We have \$250,000.00 invested in a transfer machine for our XYZ part, and we can't keep it running more than 50 per cent of the time." The inference is that the machine designer has gone too far with mechanization, and has created a product too complicated to keep in production. In all probability, this is not the case. It is more than likely that these machines were conceived without any thought or consideration for the amount of down time needed to service them.

Today, we are reaching out for the automatic factory. The success of our efforts in this direction will depend, in large measure, on our ability to control down time. Automatic factories, regardless of how nice they appear on paper, will not be tolerated if they can't be kept in production more than 50 per cent of the time. At our present stage of development, we know there is really no limit to the number of operations that can be combined into one machine or process, but as operations are combined and processes are expanded, due consideration must be given to operating efficiency. Down time without control—and to me this is the meat of the problem—is cumulative; it increases in direct proportion to the degree of automaticity. Therefore, as we study the problems of the automatic factory, it behooves us to look carefully at the reasons for down time. In our field studies, covering a large number of diversified plants, we have found the major causes to be these:

1. Down time as a result of breakdowns.
2. Down time for lubrication.
3. Down time for chip removal.
4. Down time for repairs and cleaning.
5. Down time for tool changes.

First, we have the problem of breakdowns. Everyone knows that breakdowns are unpredictable. No one knows when an accident is going to occur, or how long it is going to take to repair the damage. For this reason, many people throw up their hands, and say that nothing can be
(Turn to page 82, please)

LEADERSHIP IN LAMPS



Photometer measures lamp candlepower and is one of many tests in Tung-Sol's quality control procedure.

Tung-Sol has specialized in the design and manufacture of miniature lamps ever since electricity replaced oil for automotive lighting. Tung-Sol was first with Tultite, a double filament lamp and first with the fixed focus headlamp.

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(Continued from page 80)

done about breakdowns. To counter this type of thinking, I want to draw your attention to our Joint Industry Conference and JIC Machine Tool Standards. These Standards, and the information derived from JIC Conferences, have done a great deal to make machines more foolproof and dependable from a production standpoint. If JIC continues in this present form, I believe, that unpredictable lost time will eventually become an insignificant factor insofar as overall operating efficiency is concerned.

Down time for lubrication and chip removal can be eliminated entirely by mechanization. Most modern machines of today are equipped with automatic lubrication systems and chip conveyors, so that they need not be stopped for oiling or getting rid of chips. In thinking of machine efficiency, these causes can, therefore, be discounted altogether.

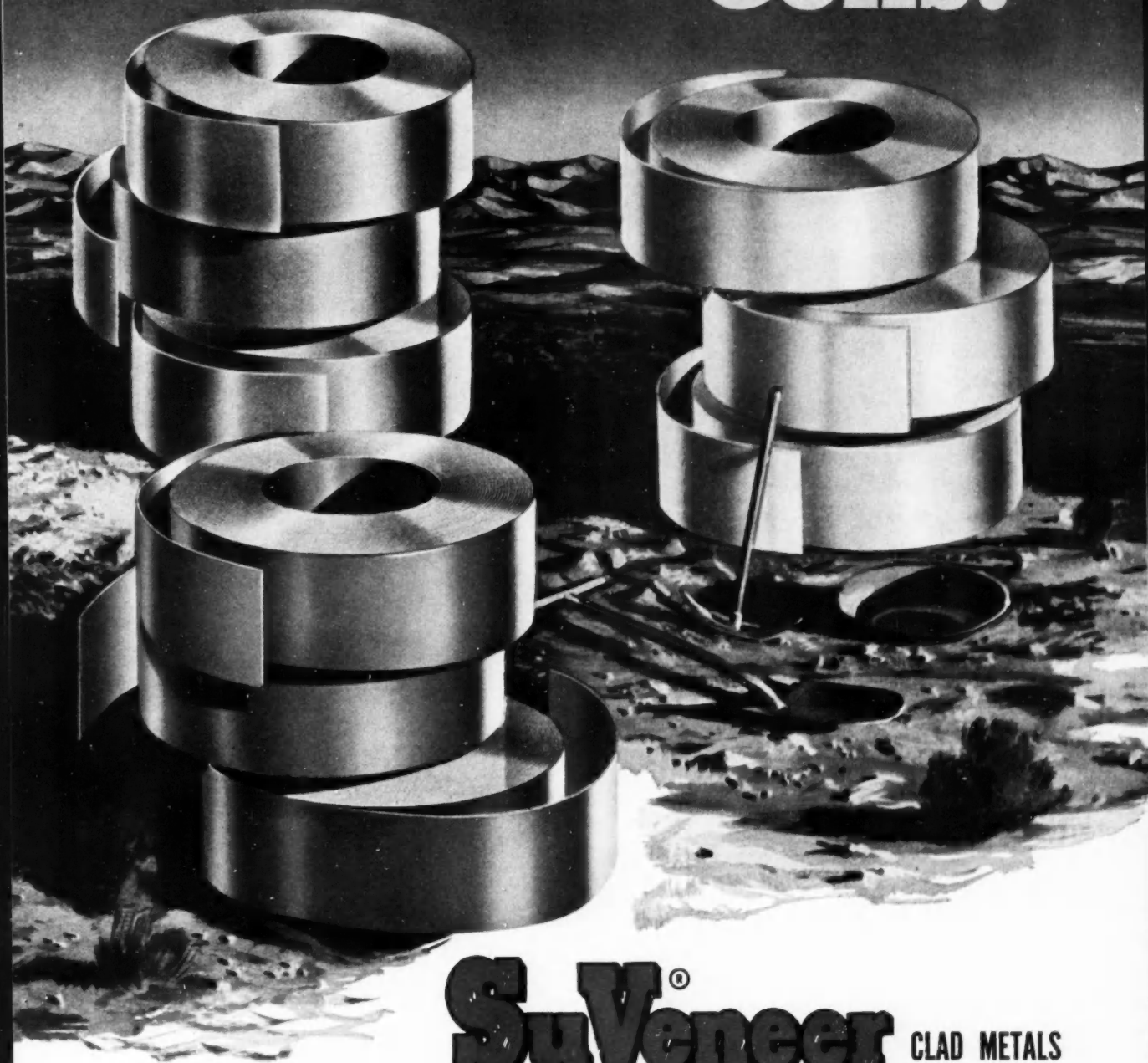
Down time for predictable repairs and cleaning can usually be deferred until there is a convenient lull in the production schedule. In many cases, however, these lulls are too infrequent, and machines are damaged unnecessarily by dirt and improper attention.

This leaves down time for changing tools as the only factor that cannot be deferred until convenient, and that, as yet, has not been mechanized to any great extent. In the opinion of machine tool users, down time for changing tools represents more than 75 per cent of all lost production time. Down time for tool changing then is the real "fly in the ointment." It is the only factor that really needs our close attention and consideration.

We know, at the present time, that complete line production can be maintained at greater than 90 per cent efficiency with the addition of certain devices which will eliminate down time for tool changes. We aren't ready to disclose all of our developments, but I will say that we are making use of all the latest gadgets, including the so-called automatic brain, and the feedback principle. To give you an example, the machine of tomorrow will decide when it is time to change tools, and it will use the information to automatically bring a fresh set of tools into operation without any lost production time or any assistance whatsoever from the operator.

(Turn to page 85, please)

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in "them thar" **Coils!**



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Balanced . . . for best performance

A radiator is only part of a cooling system . . .
but a most important part.

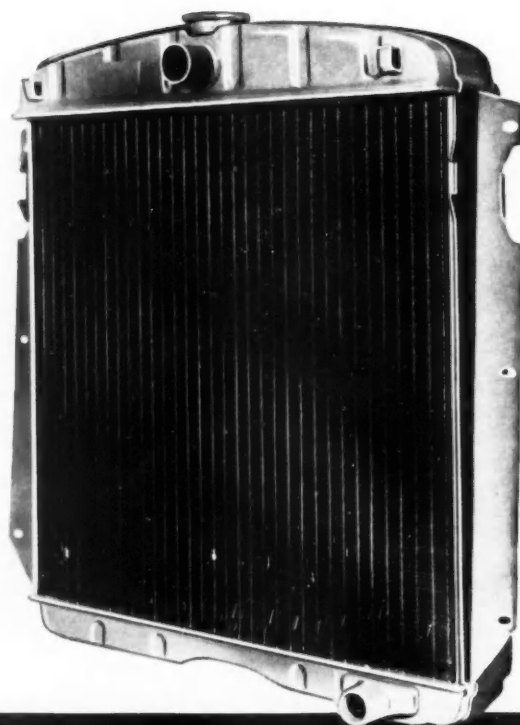
In design and performance a radiator must be
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Harrison's experience in this field over a period
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ASTE Annual Meeting

(Continued from page 82)

Metal-Bonding Processing Problems

By O. W. Loudenslager
Goodyear Aircraft Corp.

A number of processing problems are peculiar to structural bonding. These include cleaning, excessive humidity, thermal distortion, and tooling. Once cleaned, the metal must be kept clean until the adhesive has been applied. Unnecessary handling must be eliminated and clean gloves should be worn whenever the metal is touched. The adhesive should be applied promptly after cleaning to avoid contamination of the metal surface.

Extreme atmospheric humidity is a problem with a great many adhesives due to the fact that when they are applied evaporation of the solvent cools the metal surface and causes condensation of moisture between the adhesive layer and the metal, resulting in an inferior bond. This condition is commonly called "poor wetting" of the adhesive. This can be prevented by applying the adhesives in an air-conditioned room. However, where large amounts of adhesive are being applied, as in spray booths, the volume of ventilating air needed may be so great that air conditioning is not feasible from a cost standpoint. The moisture problem may be minimized by the use of less volatile solvents. It is necessary to avoid applying some adhesives when the relative humidity exceeds 40 per cent. Poor wetting may not be apparent at the time of processing, but with some types of adhesives it can be detected by the peel-test method.

Another production problem has to do with the thermal conditions present during the curing operation. Thermal warpage may also occur when materials of different thermal coefficients of expansion are bonded. This may be minimized by using adhesives with lower curing temperatures or by designing the assembly to allow thermal stresses to be relieved without producing undesirable warp. For these reasons it is desirable to use materials of similar thermal expansion coefficients in the tooling and in the assembly.

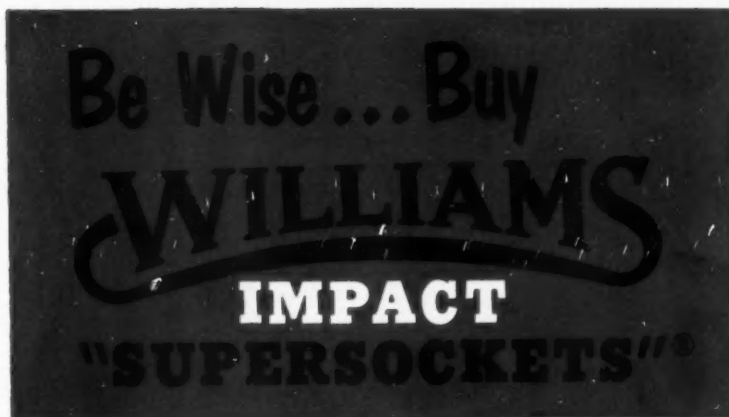
(Turn to page 86, please)

AUTOMOTIVE INDUSTRIES, April 15, 1953



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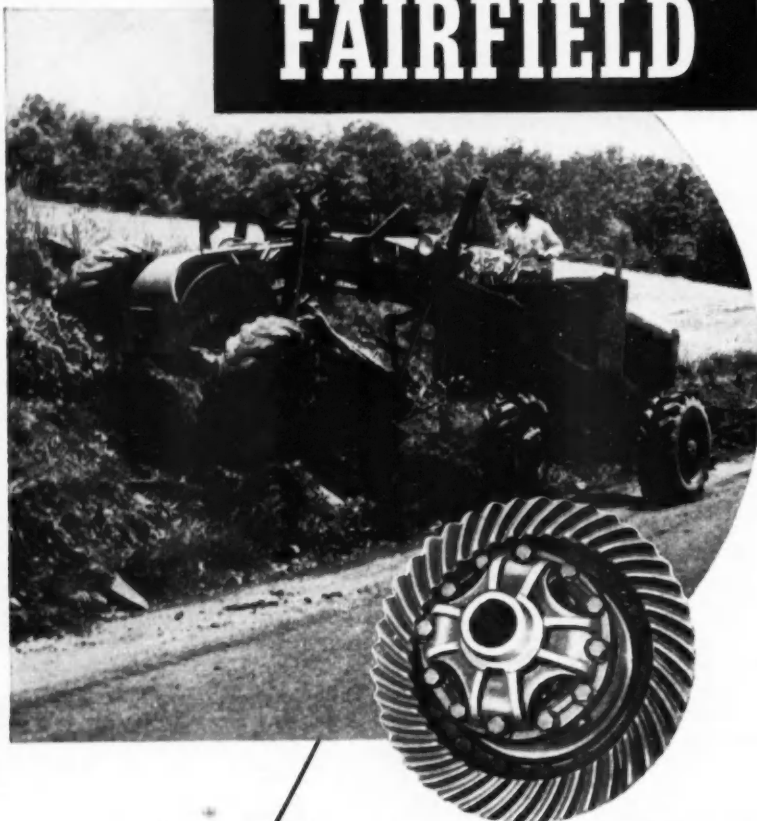
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ASTE Annual Meeting

(Continued from page 85)

At the present time the acceptability of an adhesive bond, like the acceptability of a spot weld, cannot be fully evaluated without destroying the assembly itself. The best way to insure a high-quality product is by means of rigid process control. Many attempts have been made to develop non-destructive testing methods but none have proven satisfactory for actual use. Voids or no-bond areas may be discovered easily by tapping with a metallic object, but so far the quest for a sure method of finding poorly bonded areas has been fruitless.

Tool Life in Precision Boring

By Robert S. Hahn
The Heald Machine Co.

In the case of boring holes in steel, having some sort of interruption such as a keyway, difficulty is often encountered. The cutting edge often chips. Failure of a tool by chipping should be distinguished from tool failure by flank wear or cratering wear.

Tool wear is also believed to be related to chatter. Residing on the extreme tip of the tool is usually a built-up edge. Under chattering conditions this edge may be periodically lost and may take with it a fragment of the tool.

Very large increases in tool life have occasionally been achieved by
(Turn to page 88, please)

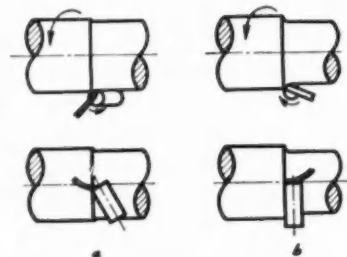
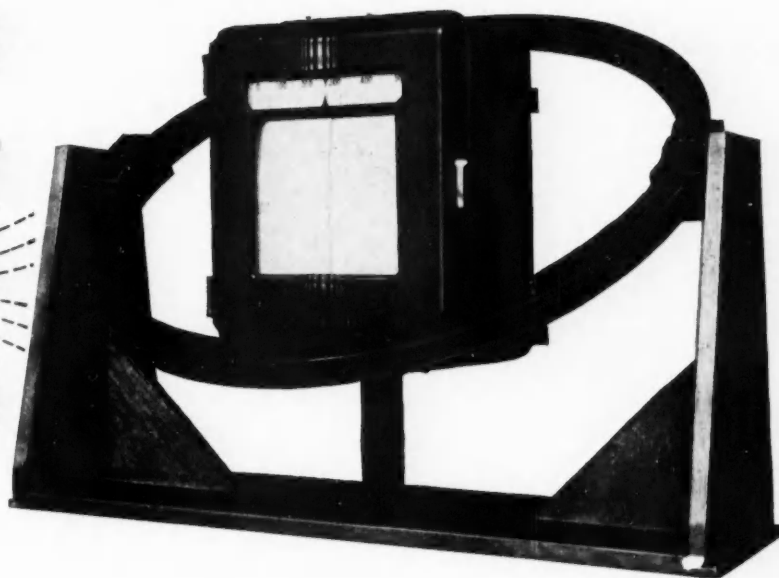


Fig. 1—Two tool orientations for chip-driven tools. (a) Rotary cutter tilted in the direction of feed; (b) Rotary cutter untilted or tilted slightly to the right.

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tact on the slidewire, which eliminates pigtails and their variable inductances. It includes use of a Mumetal slidewire shield where desirable, instead of less expensive but lower-permeability aluminum. And it includes a lot of just downright meticulous detailing, such as carefully engineered wiring and input filtering, plus ingenious shielding where required.

These and other precautions eliminate out-of-phase components in the supply to the amplifier. The latter therefore doesn't "load"; hence sends the correct amount of correct-phase power to the balancing motor. With ample power, the motor's recording and control action is snappy and accurate.

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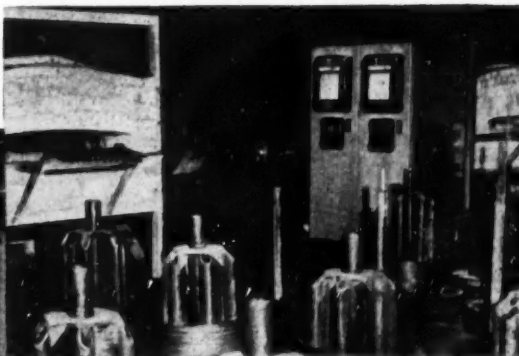


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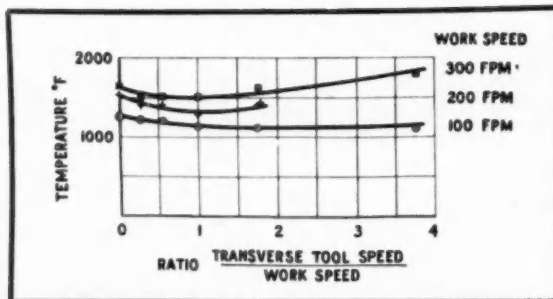
LEEDS  **NORTHROP**
instruments automatic controls • furnaces

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(Continued from page 86)

using, as a cutting tool, the end of a circular cylinder of carbide, mounted in a suitable holder to permit rotation. Figure 1 shows two possible tool orientations depending on the relative depth of cut desired. The rotary tool can be arranged so that the traction of the chip across the end face of the tool causes it to rotate, or it

Fig. 2 — Cutting temperature measured by tool-work thermocouple versus ratio of transverse tool speed to work speed. Work material, SAE 3250; hardened and drawn to 45-47 C Rockwell; tool, Kennametal KSH, —10 deg. rake, five deg. clearance.



may be driven by some external

agency. Although Fig. 1 shows the tool applied to turning, it can sometimes be used in boring large holes.

It should be noted that when the rotary cutter is tilted in the direction of feed (Fig. 1a), the angle of tilt acts like an oblique cutting edge angle for shallow cuts. The chip flows to left of center, causing the cutter to rotate counterclockwise.

When the rotary cutter is either untilted, or tilted slightly to the right (Fig. 1b) and dropped below center for clearance, the chip passes to right of center, causing the cutter to rotate clockwise. Figure 2 shows the tool-chip interface temperature measured by the tool-work thermocouple method, plotted against the ratio of transverse tool speed, (the speed at which tool material is brought under the chip) to work speed. It will be noticed that the interface temperature drops at first as the transverse cutter speed increases and then later rises again. The optimum transverse cutter speed for a work speed of 300 fpm is about 170 fpm.

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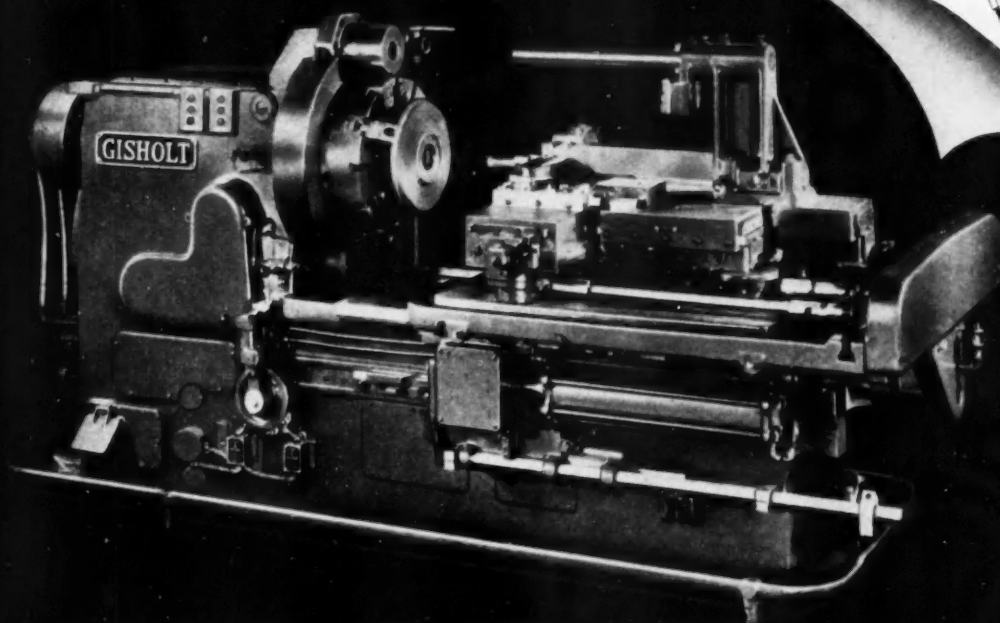
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Metal Cutting Applications of Titanium

By W. L. Kennicott
Kennametal, Inc.

Since titanium carbide alloys have no outstanding metal cutting characteristics at normal machining temperatures, their possible field of application is in hot operations. One such condition is encountered in removing the bead or flash of weld from tubing, while the metal is at 1200 F to 1600 F (Fig. 1.) A tool with a pre-ground indexable cutting insert is used. On a series of tests, the titanium carbide alloys proved superior to tungsten carbide or multiple-carbide compositions, completing the longest single run and setting the highest average footage per grind. Since the initial tests, the use of titanium car-

(Turn to page 95, please)

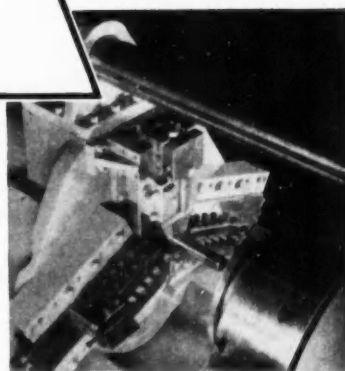


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The Radial Type Simplimatic is ideal for machining flywheels, etc., with wide faces and multiple inside and outside diameters. Extreme rigidity permits multiple tooling and maximum cutting speeds, sustained accuracy and excellent life of cutting tools.

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MACHINE COMPANY

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POWERIZED HAND TRUCKS, TOWING TRACTORS

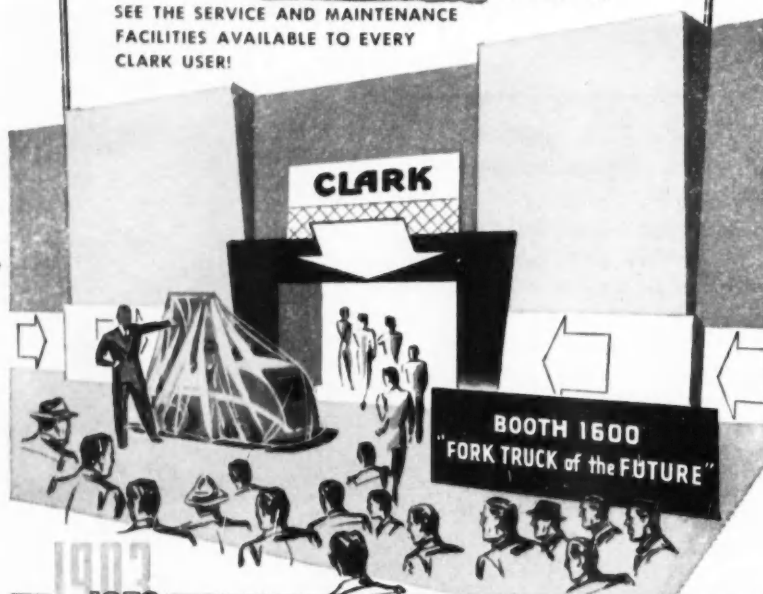
♦ **FOUR POWER UNITS** —
GAS, ELECTRIC, DIESEL, L. P. GAS

♦ **FOUR DRIVE UNITS** — STANDARD,
ELECTRIC, DYNATORK and the NEW HYDRATORK

♦ **NEW ATTACHMENTS** —
IN ACTION, HANDLING ROLLS, CRATES, BALES, ETC.

♦ **See NEW CLARK MOVIE** —
"SAFETY SAVES," DRIVER TRAINING AND SAFETY

♦ **And watch CLARK SERVICE in action!**
SEE THE SERVICE AND MAINTENANCE
FACILITIES AVAILABLE TO EVERY
CLARK USER!



1907
1953
FIRST FIFTY YEARS
CLARK
EQUIPMENT

INDUSTRIAL TRUCK DIVISION
CLARK EQUIPMENT COMPANY
BATTLE CREEK 68, MICHIGAN

WRITE FOR FREE REGISTRATION TICKETS



One billion dollars would: create a pile 60 miles high by placing dollar bills one upon the other . . . pay the total food bill for the U.S. for one week . . . buy a fleet of new cars extending bumper to bumper from Boston to Miami . . . pay the wages to all production workers in Detroit for 10 months . . . but, would take the Government only four days and 15 hours to spend at the present rate.

A late model jet fighter with afterburner can climb eight miles to intercept high flying enemy bombers in the time needed to drive a car around the block.

In testing carburetors, a prominent maker uses enough fuel in a year to make four theoretical round trips to the moon by car.

A present-day bearing two in. square in area will do the job which would have taken a 30-sq. in. bearing 25 years ago.

Sixty per cent of America's motor vehicle traffic is concentrated on seven per cent of the road mileage. Yet two-thirds of the nation's main highways are short of safe driving standards.

On a weight comparison basis, one producer uses enough zinc in a year to cast carburetors, fuel pumps, and automobile lock bodies to make 20 full-size castings of the Statue of Liberty.

A major aircraft manufacturer has to use a spare parts catalog nine feet thick to list 155,000 parts in a single air force bomber.

If a car is driven at 60 mph, it would pass over 5745 dimes (laid out in a straight line)—a distance of 336 ft.—from the time the driver saw danger ahead until the car came to a stop.

STROMBERG

CARBURETORS

**When You Consider
Carburetor *Value*—Put
Yourself in Your Customers' Shoes!**

To acquire the priceless asset of owner loyalty is the goal of every motor car manufacturer. Nothing contributes more strongly to the attainment of this end than a product that delivers *lasting satisfactory performance*. That's why it's just good business to specify engine components that maintain your standards of quality and service. In carburetors, Stromberg, because of exclusive design features and mechanical simplicity, is recognized as the carburetor that delivers *better performance longer*. Put yourself in your customers' shoes and make sure that you get lasting performance by specifying Stromberg* carburetors.

*REG. U. S. PAT. OFF.

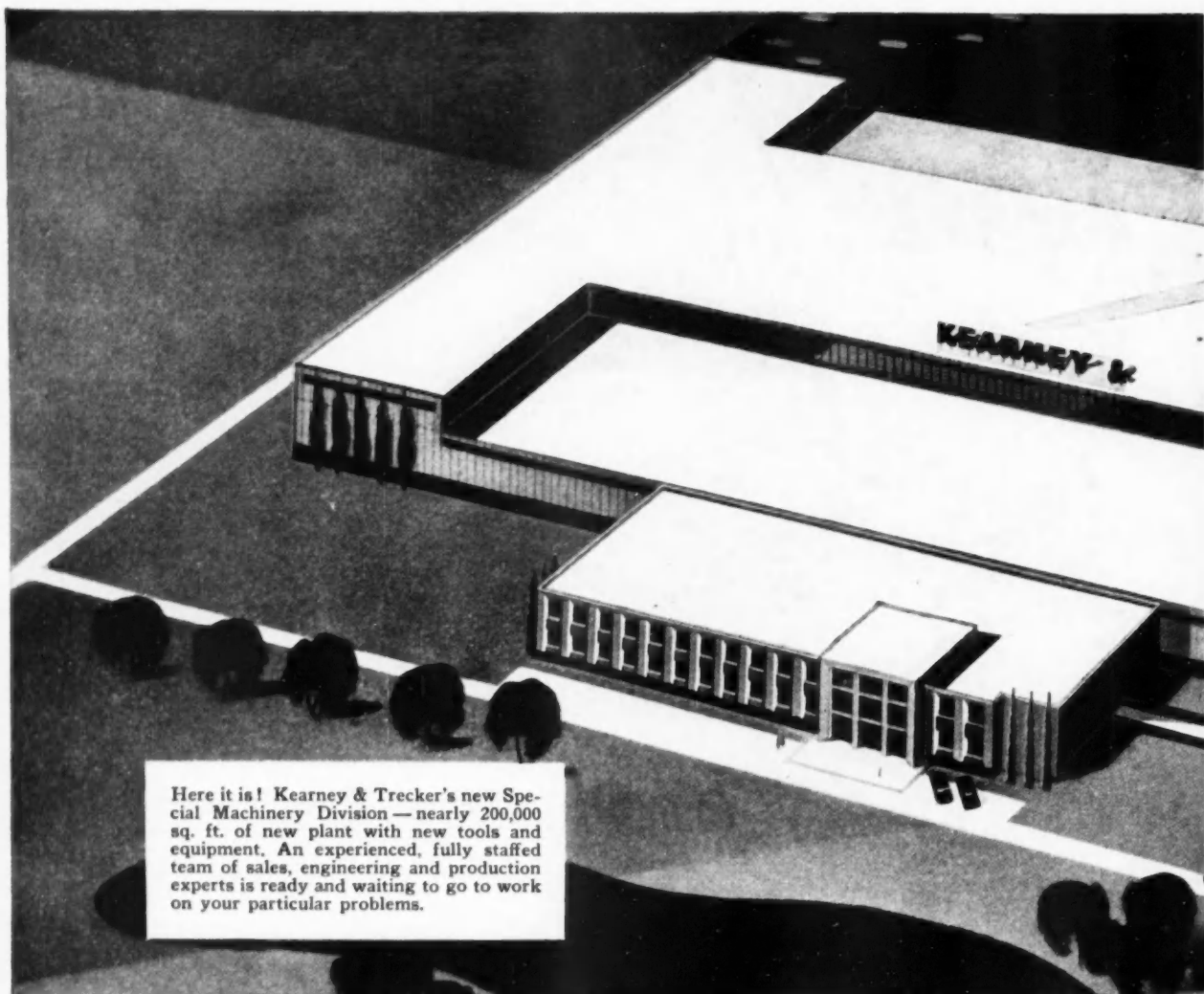
ECLIPSE MACHINE DIVISION OF

- Standard Equipment Sales: Elmira, N. Y.
- Service Sales: South Bend, Ind.



Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.





Here it is! Kearney & Trecker's new Special Machinery Division — nearly 200,000 sq. ft. of new plant with new tools and equipment. An experienced, fully staffed team of sales, engineering and production experts is ready and waiting to go to work on your particular problems.

INCUBATOR...for Production

**This plant is being built for you . . .
to engineer *new* production methods
— to build the large or small special
machines, tools and fixtures you need
to improve production and cut costs.**



Production behind schedule?

Costs going up, up and up?

Will special machines, special tools and fixtures or special arrangements of standard machines help you solve these problems?

Then why not be among the first to take advantage of the 5-million-dollar-plus investment that Kearney & Trecker is making in new plant, new tools and new engineering to help you solve them.

Kearney & Trecker is *no newcomer* to the field of special machine tools and allied special equipment. There are literally millions of dollars worth of Kearney & Trecker special machinery in plants all over the world. Equipment built over the period of more than 50 years of Kearney & Trecker's existence. And that doesn't include the 60,000



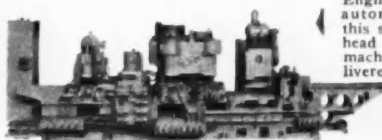
Ideas

Kearney & Trecker standard milling machines and other machine tools so well known and so widely accepted everywhere.

Kearney & Trecker is already working on new production ideas, new equipment and tool designs to be produced in this plant. Kearney & Trecker Special Engineering and Methods Analysts are ready right now to serve you with (1) Prompt response to your inquiry, (2) Immediate engineering help on your problem, plus, (3) The newest, finest and most complete facilities to build the special equipment you need — big or small.

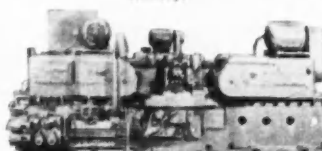
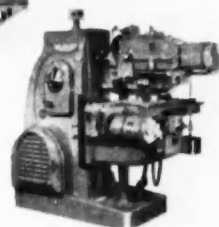
Phone, write or wire The Special Machinery Division, Kearney & Trecker Corporation, Milwaukee 14, Wis., today. Get the facts about Kearney & Trecker's Special Machinery Division and how it can serve you.

HERE ARE SOME OF THE MACHINES KEARNEY & TRECKER HAS BUILT:



Engineered and built for an automotive manufacturer, this seven-station traveling head transfer-type milling machine is one of five delivered in 1952.

Special knee-type cam milling machine — the first of twelve such machines to be built for the nation's largest manufacturer of shoe-making machinery.



This huge four-station rotary indexing machine, built for major automotive manufacturer, is equipped with three horizontal milling heads.

Here is a partial list of the machines that will be built:

Standard and special bed type milling machines.

Special index milling machines.

Special transfer milling machines.

Special index or transfer machines involving a combination of milling, boring, drilling or tapping to perform all operations on a workpiece.

Special machines for the automotive, aircraft and farm implement industries.

Special boring machines.

Rise and fall milling applications.

Modified standard and special knee-type milling machines.

Special tooling for standard milling machines.

**you can depend on Chicago Rawhide
for reliable solutions to your
mechanical sealing and protection
problems**



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**SCIENTIFICALLY
COMPOUNDED
ELASTOMERS**

(Synthetic Rubber)

When you need an oil-resistant, pliable part with an exact degree of flexibility, hardness, resistance to extreme temperatures, fluids, gases, abrasion and wear . . . whether it be an intricately designed diaphragm or boot . . . or a simple but critical packing or gasket . . . Sirvene will serve you dependably.

Write for
"Engineering with Sirvene"



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**MECHANICAL
LEATHER PRODUCTS**

Actual tests prove Sirvis packings require less replacement than any other type. Made in a complete line of cup, flange, U and V types from specially treated and tanned steerhide. Available in special designs, scientifically engineered to solve unusual situations.

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Sirvis Mechanical Leather Catalog**



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Oil Seals

The "Perfect" answer to fluid retention, moisture and foreign matter exclusion, and similar mechanism protection problems. Used more than any similar device in motor vehicles, industrial machines, farm implements, and road machinery. Stocked in over 1800 sizes, covering 16 different types.

Write for
"Engineering with C/R Oil Seals"



ASTE Annual Meeting

(Continued from page 88)

bide alloys for flash trim has become standard practice in several tube mills.

A similar application from the cutting condition standpoint is in hot machining, where a steel workpiece is heated rapidly to a surface temperature of about 1600 F just ahead of the tool to increase the rate of metal removal reduce power and tool thrust, and improve finishes. On one such test run recently, a titanium carbide grade produced thirty times the life of a conventional tungsten carbide grade, and three times the life of the best standard cutting grade of carbide.

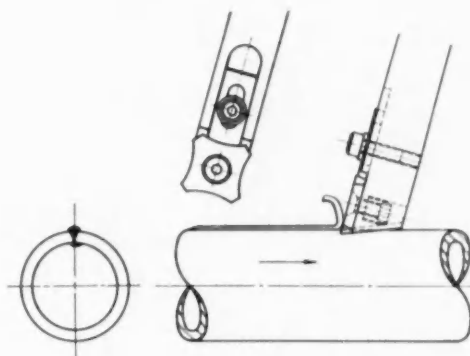
These chip removal operations at elevated temperature do not involve high tool loadings, because the steel being cut has relatively low shear strength at these temperatures, but thermal shock and high temperature abrasion are severe.

BOOKS...

STATISTICAL THEORY WITH ENGINEERING APPLICATIONS, by A. Hald, published by John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. Price, \$9.00. This significant work by a professor of statistics at the University of Copenhagen maintains the belief that theory and practice must go hand in hand. As an example, the author cites theory for its usefulness in solving specific engineering problems. Without resorting to advanced mathematics, the text traces the essence of statistical progress over the last 50 years with the aid of elementary calculus. The book is so wide in scope as to defy condensation in a review, but a brief sampling of chapter headings will indicate its broad coverage: fundamental calculus of probabilities; normal distribution; skew distribution; distribution of the mean; statistical control; analysis of variance; designs of sampling investigations and experiments; binomial distribution; main points of a statistical analysis.

MOUNTING DIMENSIONS OF LUBRICATING AND COOLANT PUMPS FOR MACHINE TOOLS, published by The American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. Price, \$1.00. This standard insures quick and easy replacement for lubricating and coolant pumps on machine tools. Its six tables of specific mounting dimensions cover motor driven centrifugal pumps (vertical submerged type), centrifugal and geared pumps (motor foot-mounting types), centrifugal pumps (flanged-mounted type), and gear and vane pumps (foot-mounted).

Fig. 1—Indexable insert of titanium carbide alloy, used for removing hot (1500 F) bead from welded steel tubing.



AIRCRAFT GENERATOR TESTER
SUN model AGT-2

Especially designed to comply with United States Air Force Specification MIL-S-7223, this unit will test 28-volt aircraft and similar DC generators with output capacities up to 600 Amperes and speed ranges from 2000 to 11,500 RPM.

industry's leaders depend on Sun

... for special-order, built-to-specification scientific test equipment ...

Sun Electric Corporation is the world's largest manufacturer of Automotive and Aircraft Electrical and Electronic Testing Equipment, supplying approximately 70% of the testing equipment of this type to U.S. automotive dealers. That is why the leaders in every branch of the industry look to Sun as the logical choice to design and build special scientific equipment to meet their particular testing needs. The unit pictured is an example of a test problem solved with such specially designed equipment. Other Sun special-order units are in use in car, truck and tractor factories, aircraft and ordnance plants and in the factories of engine and component parts manufacturers everywhere. In production testing, spot checking and in quality control of material these special Sun Testers offer a high speed simplified operation that will save thousands of dollars and many production headaches.

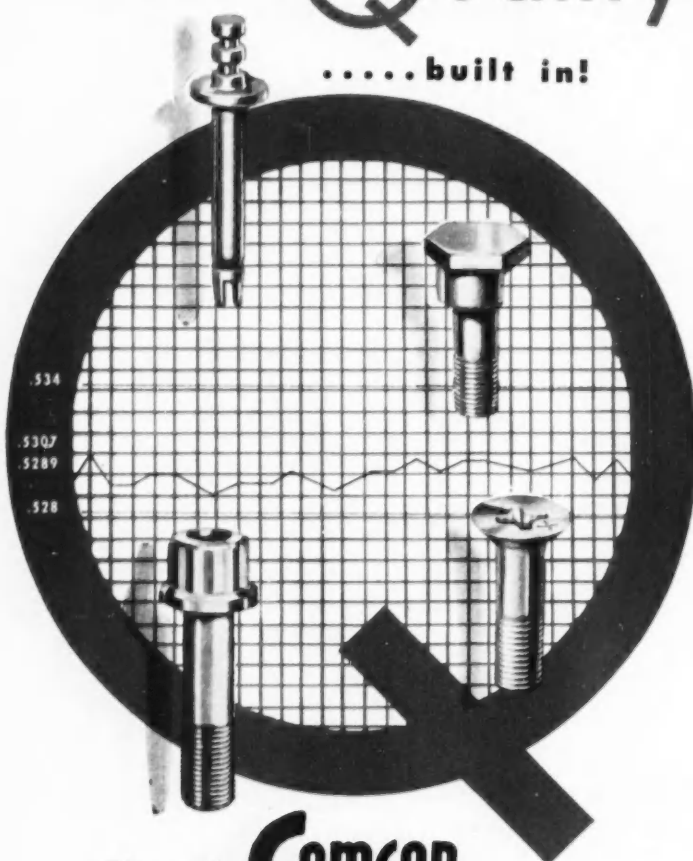
SUN **ELECTRIC CORPORATION**

6373 AVONDALE AVE., CHICAGO 31, ILLINOIS

DO NOT GUESS—TEST! SUN Engineers will be glad to discuss the design of special test equipment that can solve your testing problems too! Write TODAY for the SUN SPECIAL TEST EQUIPMENT Catalog.

SUN Equipment is available in 6-12-24 volt units.

measured **Quality**built in!



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CAMCAR
COLD-FLOW

guaranteeing the degree of excellence
you require in Fasteners and
Special Metal Parts!

Camcar technicians build quality, not inspect it,
into parts and fasteners. That's why Camcar
developed Cold-Flow processing, to furnish peak
control in metal forming.

It's also the reason you can expect top finish, accuracy,
grain structure and tensile strength when you
use Camcar Cold-Flow parts. Constant quality
control checks insure the consistently superior parts
produced through Cold-Flow techniques.

When you need Fasteners or Special Metal Parts—

Telephone 5-9451 or Teletype RK 8653



CALENDAR

OF COMING SHOWS AND MEETINGS

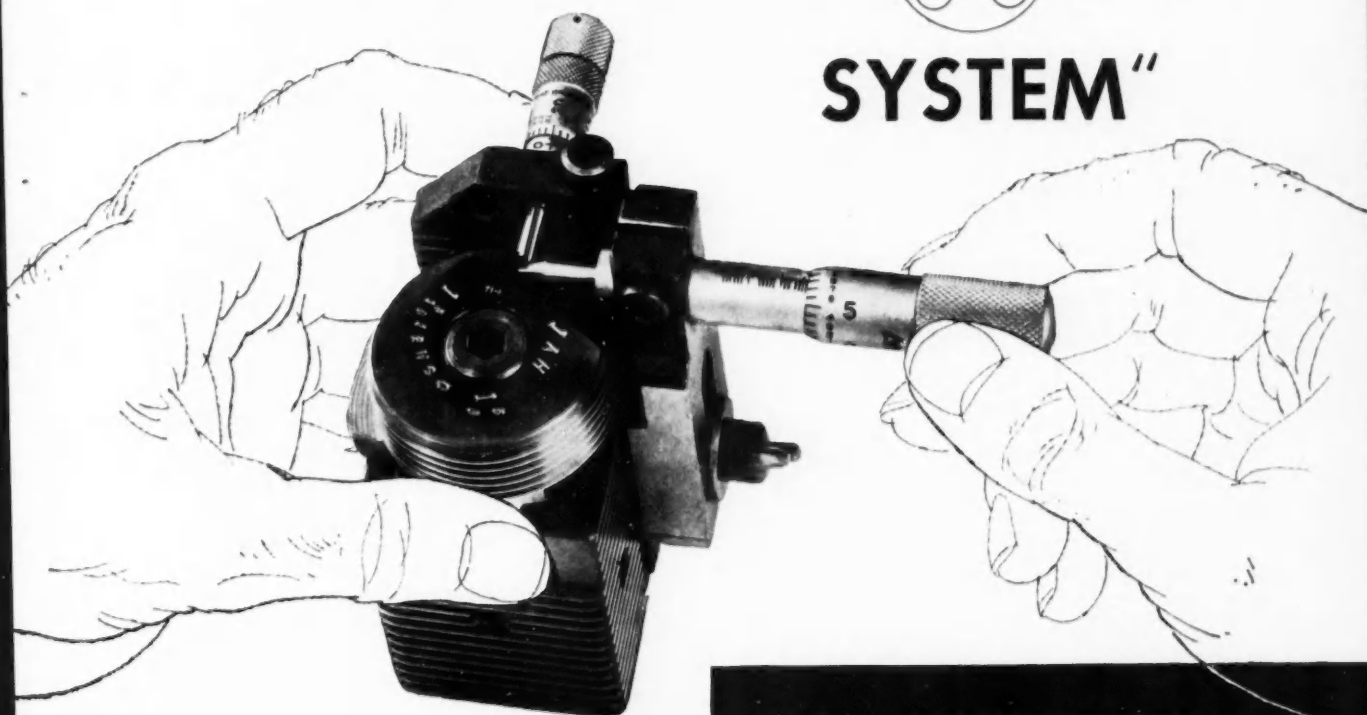
- 9th Annual Meeting and Show, Metal Powder Association, Hotel Cleveland, Cleveland, O.Apr. 20-22
- SAE National Aeronautic Meeting and Aircraft Engineering Display, Hotel Statler, and Aircraft Production Forum, Hotel Gov. Clinton, New York, N. Y.Apr. 20-23
- 22nd National Packaging Exposition & Conference, American Management Association, Navy Pier, Chicago, Ill.Apr. 20-23
- World Auto Show, Municipal Auditorium, Long Beach, Calif.Apr. 22-26
- Annual Turin Automobile Show, Turin, ItalyApr. 22-May 3
- British Industries Fair, London and Birmingham, England.Apr. 27-May 8
- American Society of Mechanical Engineers, Spring Meeting, Deshler-Wallach Hotel, Columbus, O.Apr. 28-30
- 9th Annual Forum, American Helicopter Society, Mayflower Hotel, Washington, D. C.May 14-17
- Fifth Materials Handling Exposition, Convention Hall, Philadelphia, Pa.May 18-22
- Society for Experimental Stress Analysis, Spring Meeting, Hotel Schroeder, Milwaukee, Wis.May 20-22
- Society of Photographic Engineers, Third Annual Conference, Hotel Thayer, West Point, N. Y.May 20-22
- American Gear Manufacturers Association, Annual Meeting, The Homestead, Hot Springs, Va.May 30-June 3
- 1st Annual Michigan Motor Show, State Fair Grounds, Detroit.June 2-7
- SAE Summer Meeting, The Ambassador and Ritz-Carlton, Atlantic City, N. J.June 7-12
- 2nd International Aviation Trade Show, Hotel Statler, New York, N. Y.June 9-11
- Exposition of Basic Materials for Industry, Grand Central Palace, New York, N. Y.June 15-19
- 14th Iowa Management Course, State U. of Iowa, Iowa City.June 15-27
- 20th International Aeronautical Meeting, Le Bourget Field, Paris, FranceJune 26-July 5
- American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.June 29-July 3
- Sixth Annual International Aviation Exposition, Detroit, Mich.July 9-12
- National Aircraft Show and 50th Anniversary of Powered Flight, Vandalia Airport, Dayton, O.Sept. 5-7
- Eighth National Instrument Conference and Exhibit, Chicago, Ill.Sept. 21-26

Temco Absorbs Luscombe

Temco Aircraft Corp. and Luscombe Airplane Corp. approved an agreement of merger under which Luscombe would be merged with and into Temco. Luscombe facilities will continue to be used for subcontract work, and a saving in bookkeeping will result from the merger.

another reason why owners say —

"We use the VERS-O-TOOL SYSTEM"



They call it a "system" because, among other exclusive features, Vers-o-tools are provided with a patented Namco Micrometer that takes the guess-work out of chaser grinding.

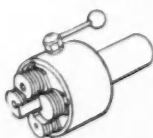
No trial cuts, no adjustments, no time or scrap loss. And by providing an extra set of chasers, kept ground in the tool-room and ready, you put long run jobs on a continuous production basis. Time saved by using this gage frequently adds thousands of precision threads—reduces your costs.

Other Advantages of the System

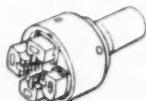
Standard Vers-o-tools use either the famous ground thread circular chasers or the lower cost, adjustable-blade, ground thread chasers—interchangeable die size for die size, in both revolving and non-revolving self-opening heads. The same system applies for end forming and end turning cutters. Use of knurls and rolls is common practice.

Once you start using Vers-o-tools, you are immediately equipped for a more versatile use of threading equipment, at a lower tool investment, than is possible from any other source.

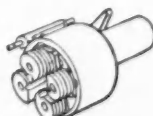
Ask for DT-52, complete new catalog on Vers-o-tool and Namco Solid and Collapsible Taps.



Style D6 Vers-o-tool
(Non-revolving Type)
10 Sizes, $\frac{1}{8}$ "— $6\frac{1}{2}$ ".



Style DR Vers-o-tool
(Revolving Type)
13 Sizes $\frac{1}{8}$ "— $6\frac{1}{2}$ "
Shown with Adjustable
Blade Chasers
7 Sizes, $\frac{1}{8}$ "—2".



Style DBS Vers-o-tool
(for B&S Automatics)
3 Sizes, $\frac{1}{4}$ "— $\frac{1}{2}$ ".

Patented NAMCO MICROMETER

*takes the guess-work out of
chaser grinding*

THIS IS THE WAY IT WORKS:

- ★ Remove chasers from Vers-o-tool head (in one minute) and take a micrometer reading.
- ★ Regrind them to the same micrometer reading. (Perfect control of the grind is automatic through serrated mounting of circular chasers—rechecking on the gage proves their uniformity.)
- ★ Replace chasers in head (one minute) with certainty that they will cut threads identical to those cut on previous grinds.

24-HOUR DELIVERIES ON MOST STANDARD STOCKABLE NC AND NF CHASERS AND BLOCKS—ALSO NATIONAL TAPER PIPE AND DRY SEAL

The NATIONAL ACME CO.

170 EAST 131 STREET, CLEVELAND 8, OHIO.

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8-Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing

NIAGARA

Presents

outstanding design features:

Double End Twin Drive with double reduction gearing (for straight bends and smooth power application.)

A rigid One-piece Frame with permanently welded crown for minimum deflection and permanent alignment.

Laminated Non-Metallic Ways maintain accurate alignment and assure longest life of dependable service.

Deep Twin Plate Steel Bed with open slug clearance for multiple punching work.

Powerful Air Cooled Friction Clutch and Brake assures easy ideal "Press Brake Action".

Air Electric Clutch Control may be operated by palm buttons on ram or foot switch with provisions for "Inching", "Single Stroking" and "Continuous Run".

Reversible Flywheel can be pulled out of accidental stalls.

Power Adjusted Ram with self-locking adjusting screws.

Micrometer Dials accurately indicate position of ram so die settings can be quickly repeated.

Accessibility at rear with plenty of clear working space for safety.

Gages with full horizontal and vertical adjustment for front or rear of press.

Angle Support Brackets and Bolster Plates quickly convert press for stamping operations without affecting bending ability.

All gears operate in totally enclosed sealed baths of oil.

versatility of operations

BENDING

FORMING

DRAWING

BEADING

CURLING

CORRUGATING

BLANKING

EMBOSSING

JOGGLING

NOTCHING

PUNCHING

PIERCING

PERFORATING

SLITTING

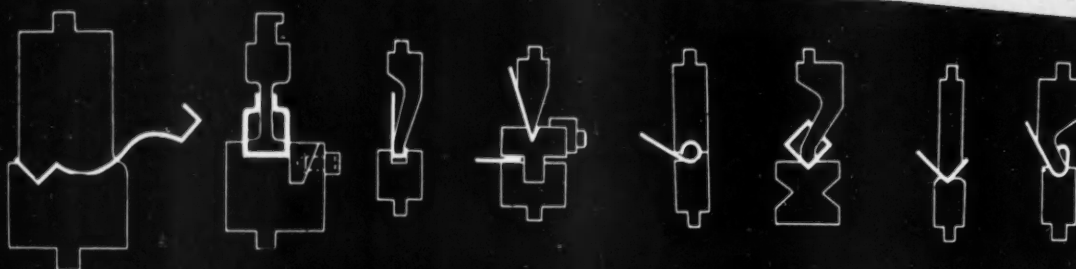
TRIMMING

ETC.

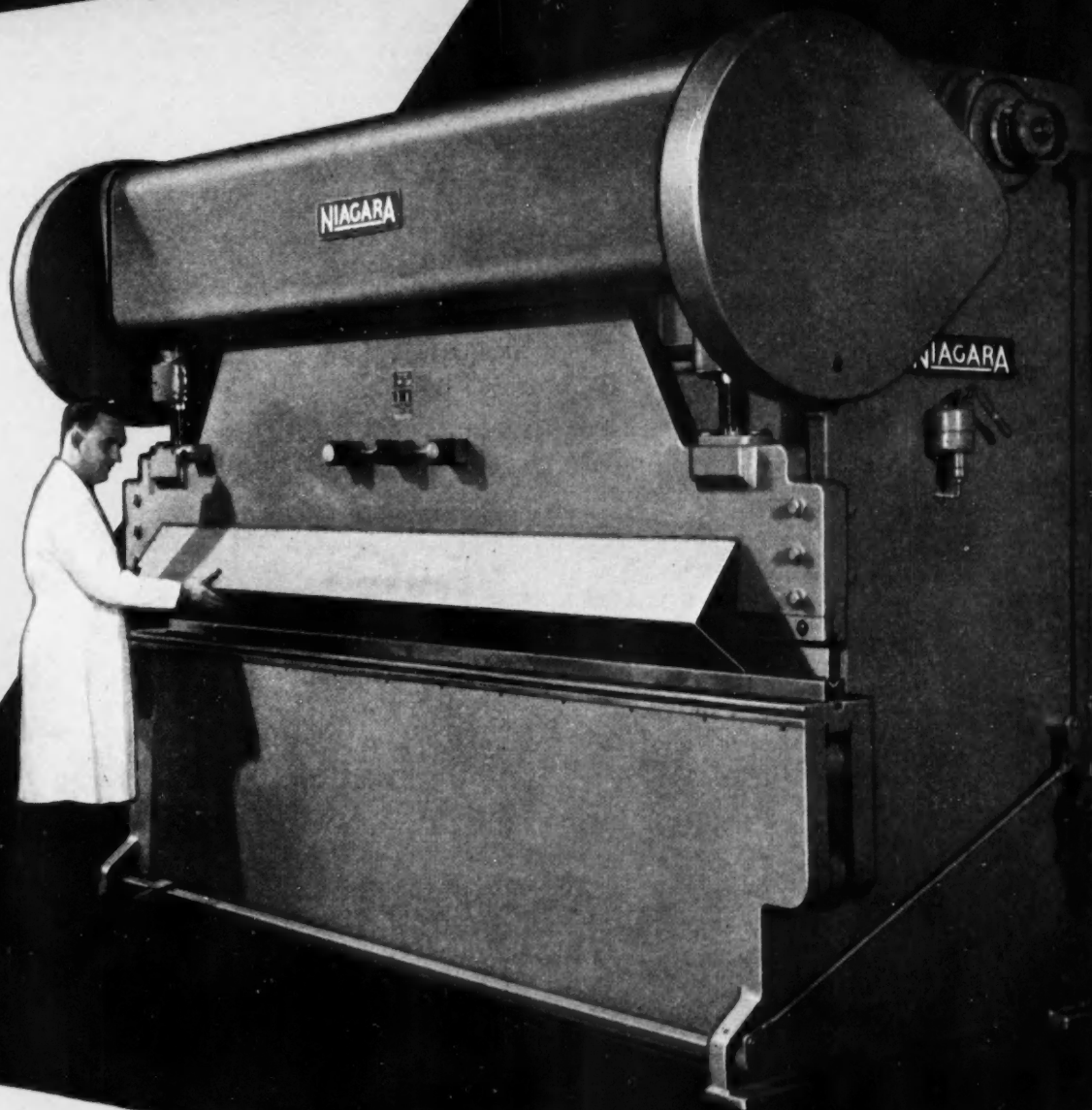
WRITE FOR BULLETIN 89



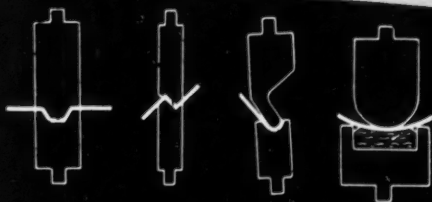
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The Last Word in New All-Steel **PRESS BRAKES**



DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK, PHILADELPHIA



*America's Most Complete Line of Presses, Shears,
Machines and Tools for Sheet Metal Work*

Dealers in principal U. S. cities and major foreign countries

Evolution of the F-86 Sabre Jet Fighter

(Continued from page 48)

the best straight wing airplanes, the only difference being a higher angle of attack for take-off and landings.

Superior maneuverability at high speeds and high altitudes was demonstrated by the F-86A. The low drag of the swept wing at high speed left extra thrust over that which a straight wing would require for level flight. The extra thrust could be used

for much improved level flight and climb maneuvers. The swept wing also had higher available lift than the straight wing at high speeds. This feature made it possible to keep the Mach number high on the F-86A in diving turns where lift is usually the limiting factor for a straight-wing fighter.

The fuselage speed brakes provid-

ed effective deceleration in any attitude throughout the airplane's speed range. These brakes could be opened at sonic velocity. At the time this was first demonstrated, no other fighter brakes had been opened at such speed.

As flight testing progressed, improvements and refinements were made on the F-86A. The wing and fuselage were strengthened. A jettisonable canopy was designed and installed, as well as a system for heating gun and ammunition compartments. After a number of airplanes were out the door, a canopy defrosting system effective at all altitudes was provided.

With the F-86A in production, the engineers turned their talents to developing the design. The F-86B study called for somewhat larger tires and a wider fuselage to accommodate them. However, because of tire and brake developments at this time, the Air Force accepted a proposal by the company for smaller, higher pressure tires and the B design was dropped.

The F-86C became the YF-93A, the penetration fighter proposal. Although a change in Air Force requirements eliminated quantity orders for this fighter, there are few airplanes in service today that are as fast, or that are equipped with such a powerful engine, the Pratt & Whitney J-48 with afterburner. YF-93A's have performed valuable service in flight test and research, particularly for the Ames Laboratory of the NACA at Moffett Field, Calif., where two of the fast jets were used to supplement wind tunnel research in NACA studies of air inlets for missiles and high-speed aircraft.

Work was started at North American on the interceptor version of the Sabre a month after March Field pilots got their first A's. The company at that time initiated engineering and preliminary tool design for modification of two F-86A's into interceptors, and construction of an interceptor mock-up was begun in June. Designed specifically to fly very quickly to extreme high altitudes, the interceptor version was powered with an improved General Electric J-47 engine with afterburner. The engine was equipped with revolutionary automatic electronic controls—"brain boxes"—which automatically

(Turn to page 103, please)

ASSURED DEPENDABILITY

Lamb Electric

SPECIAL APPLICATION
FRACTIONAL HORSEPOWER
MOTORS

• The satisfactory experience of users of many thousand types of products equipped with Lamb Electric Motors has proved the importance of designing the motor for the particular application.

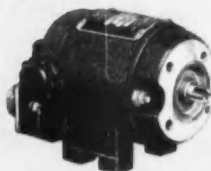
By providing the exact mechanical and electrical requirements, special engineering assures dependability and other motor qualities essential for outstanding product performance.

Other advantages usually obtained with Lamb Electric specially engineered motors are—savings in space, weight and cost factor.

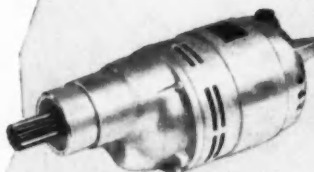
The time to realize the full benefits of a Lamb Electric Motor is while your product is in the design stage.

The Lamb Electric Company
Kent, Ohio

In Canada: Lamb Electric—Division of
Sangamo Company Ltd.—Leaside, Ontario



Compactly designed motor developed for metering pump and special instrument service.



Geared head motor with low output shaft speed for many slow speed heavy-duty drives.

THEY'RE POWERING
AMERICA'S *Finest* PRODUCTS

Lamb Electric

SPECIAL APPLICATION
FRACTIONAL HORSEPOWER **MOTORS**



horsepower zero

This is the acme of hooking, buckling, useless horsepower. In many smaller ways, it is typical of power wastes that may leak out between motor and traction surface in automotive vehicles.

Spicer has nearly 50 years' experience in helping manufacturers secure maximum efficiency from generated horsepower.

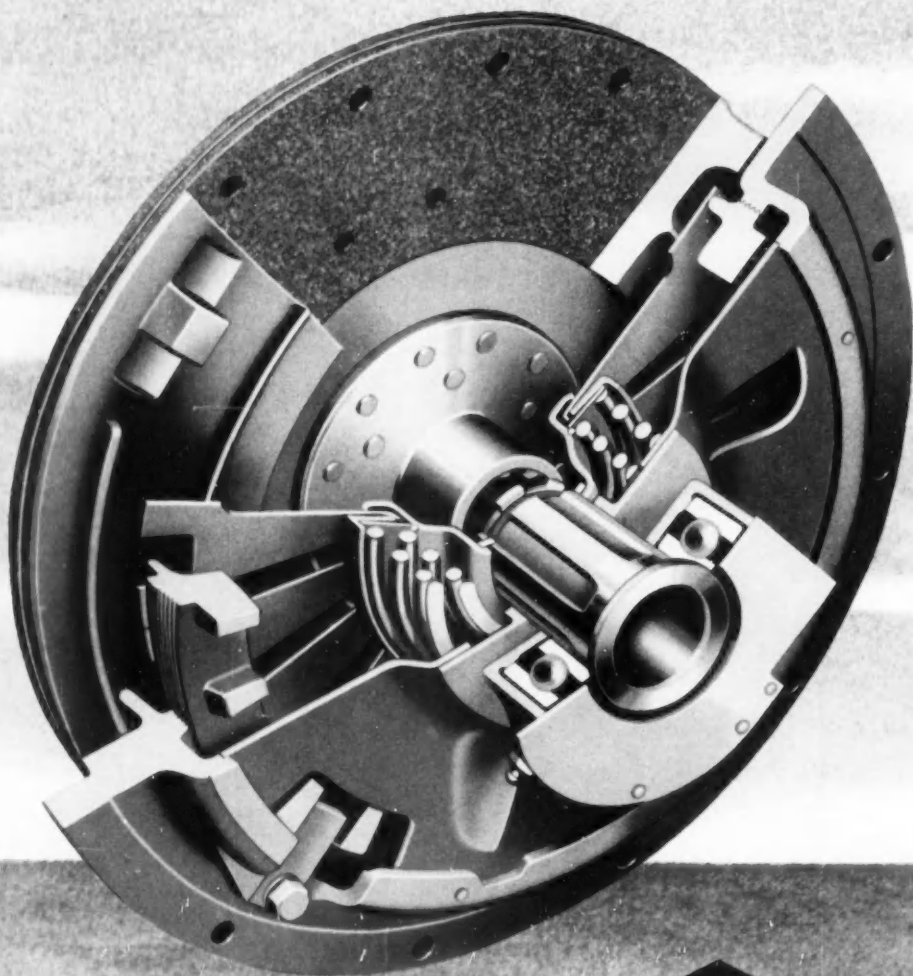


smooth sailing

The zephyr touch . . . the effortless engaging . . . the cloud-floating action of the Spicer Brown-Lipe Clutch are well-known to the heavy-duty truck and bus operators. They readily accept the small initial higher cost in exchange for the exceptional performance . . . and long life . . . assured by the many exclusive features in this Spicer unit. It is the

Standard of the Industry

SPICER MANUFACTURING DIVISION of Dana Corporation • TOLEDO 1, OHIO



49 YEARS OF
Spicer
SERVICE

TRANSMISSIONS • UNIVERSAL JOINTS • BROWN-LIPE AND AUBURN CLUTCHES • FORGINGS • PASSENGER
CAR AXLES • STAMPINGS • SPICER "BROWN-LIPE" GEAR BOXES • PARISH FRAMES • TORQUE CONVERTERS
• POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES

ENGINEERING
DANA
MANUFACTURING

We Endorse the Junior Achievement Program

F-86 Sabre Jet Fighter

(Continued from page 100)

regulated the flow of fuel through the engine to bring about the best performance under any conditions. The electronic system consists of a single lever for engine control, several "sensors," devices which translate temperatures, speed and similar information into electrical readings, and two electronic computers which digest the information.

The interceptor was initially designated the YF-86D, then became the F-95A, and later re-designated the F-86D.

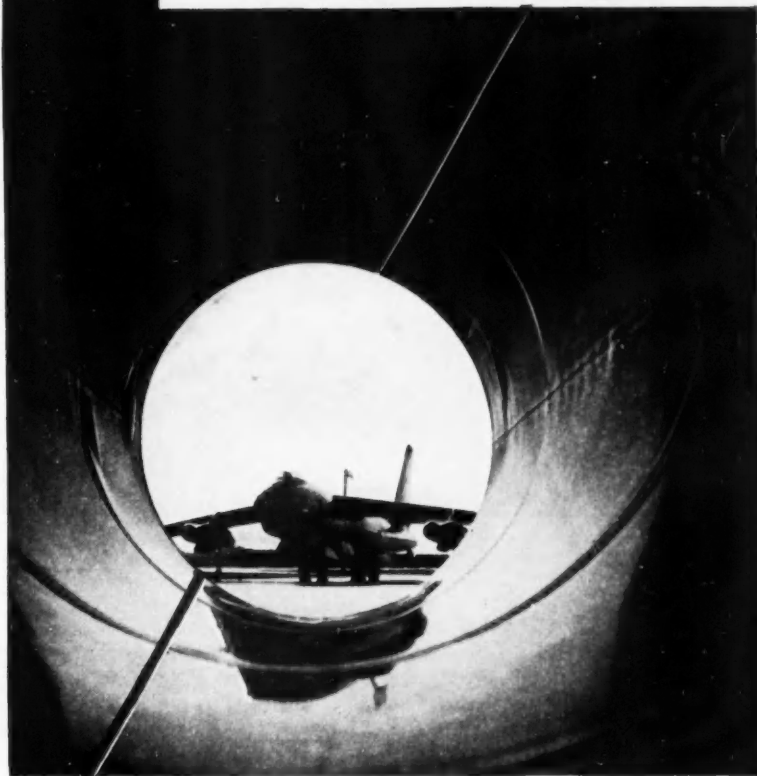
North American Aviation pioneered in the application of the Navy's 2.75 "Mighty Mouse" rocket, and this was the armament selected for the new interceptor. At that time, the electronic fire control system under development by the Hughes Aircraft Co., the new Mighty Mouse rocket, packing enough punch to bring down the world's biggest bomber, and the swept-wing Sabre design was believed to be the combination that would give the United States a continental defender very close to the ultimate in piloted airplanes. The F-86D was the first jet airplane to air fire a Mighty Mouse rocket, the "right combination" being worked out by North American armament engineers in a series of tests at NOTS, Inyokern. The nation's only one-man interceptor, the first to have all-rocket armament, equipped with the electronic fire control system to hunt down an enemy at night or in any weather, this airplane design was nearing that last step before leaving the pilot on the ground and letting fully electronic equipment take over the entire job of interception.

During the development of the F-86D interceptor, an interesting new control system was being developed by the company with the use of two F-86A airplanes. This change, called the "all flying tail" was incorporated in the next step in the Sabre series, the F-86E. Whereas the F-86A had a booster control system, in which the pilot did part of the work, the E Sabre had full power-operated controls for better maneuverability at high speeds.

This new system had adequate control power to assure complete maneuverability at extreme speeds. "Artificial feel" was built in to give the pilot forces on the stick which were

(Turn to page 106, please)

The Right Viewpoint



When you're thinking about aluminum or magnesium castings, you need the services of an organization with the right viewpoint.

We're referring, of course, to the right viewpoint toward the best possible use of these two light metals . . . ability to do the job; . . . service; . . . adequate facilities for production; . . . experience.

We here at Wellman like to think we have a combination of all these things . . . trained, interested personnel, three complete foundries and a modern pattern shop, almost a half century of experience in solving casting problems.

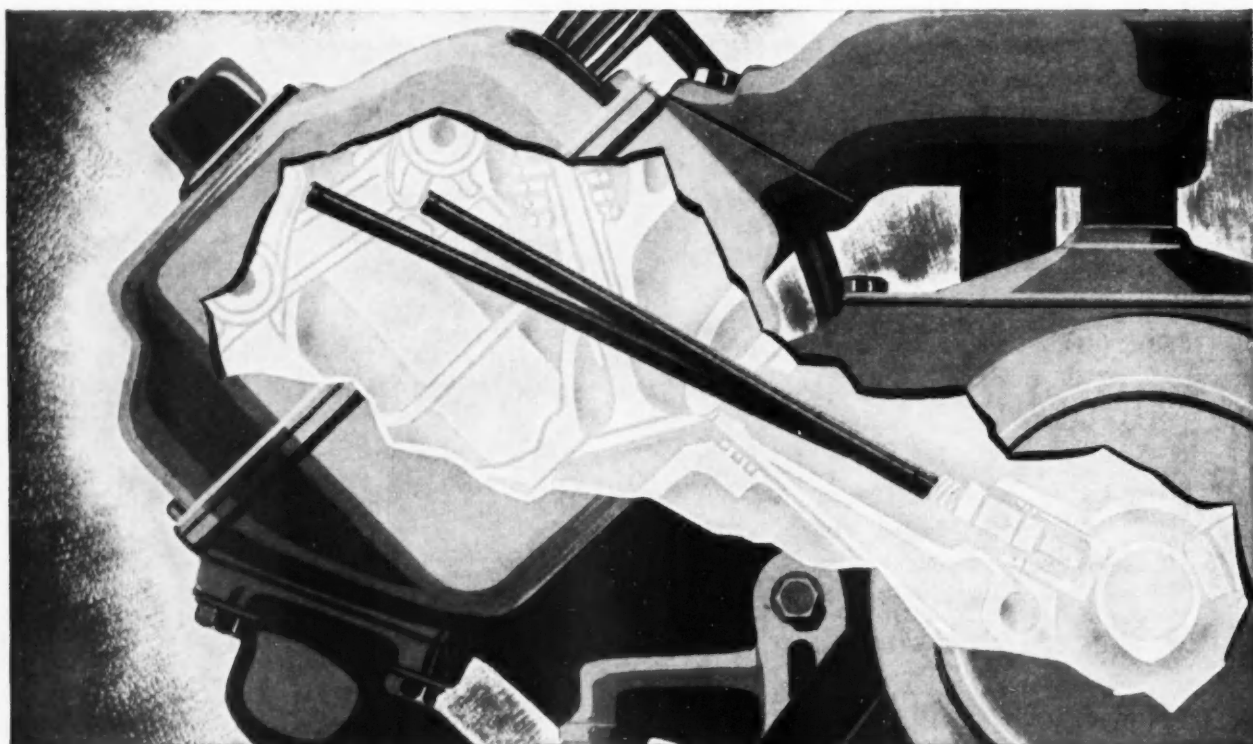
Why don't you try us and see how we look from your viewpoint?



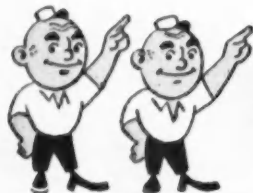
- Well-Cast Aluminum and Magnesium Castings
- Well-Made wood and metal patterns

THE WELLMAN BRONZE & ALUMINUM CO.

DEPT. 3, 12800 SHAKER BLVD., CLEVELAND 20, OHIO



1 Today's sharp swing toward higher horsepower overhead engines for passenger cars has resulted in many new solutions to old automotive problems. One result: Push rods of Bundyweld Tubing, long proved in truck engines.



Push rods of Bundyweld Tubing called for by newest trend in engine design

WHY BUNDYWELD IS BETTER TUBING



Bundyweld starts as a single strip of copper-coated steel. Then it's . . .



continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Copper coating fuses with steel. Result . . .

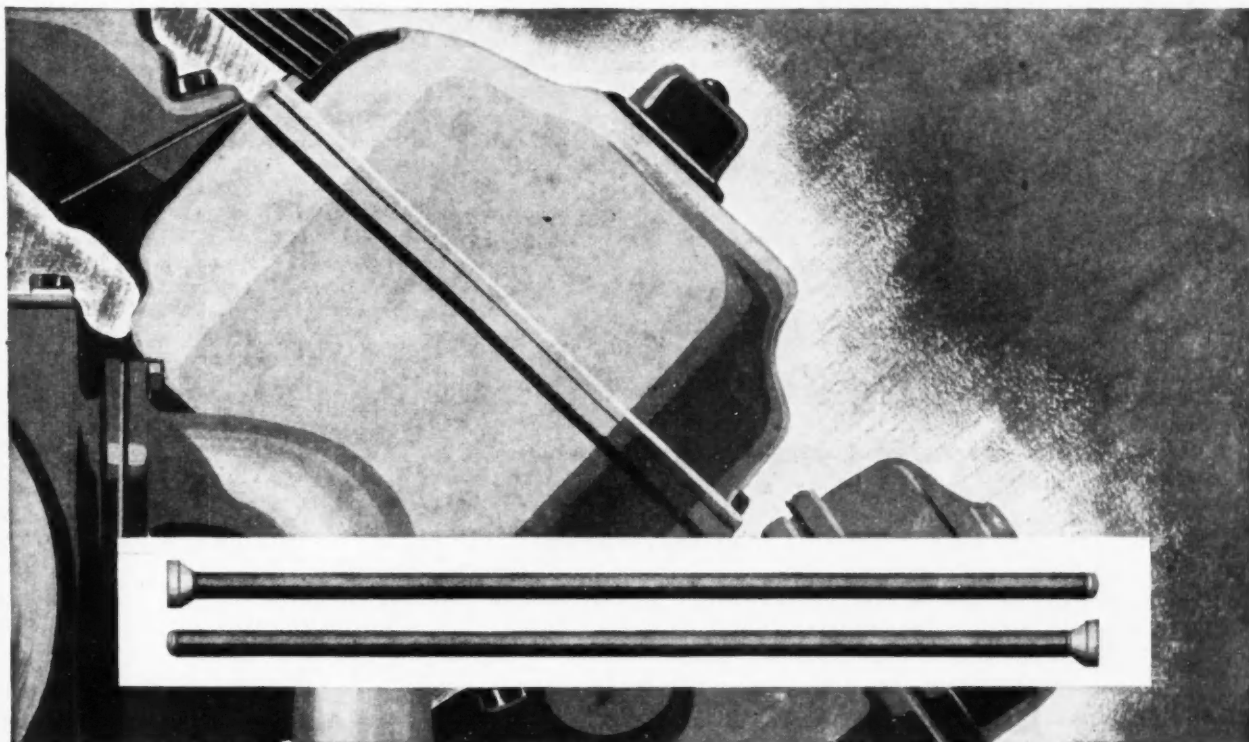


Bundyweld, double-walled and brazed through 360° of wall contact.



NOTE the exclusive patented Bundyweld beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • Chattanooga 2, Tenn.: Pearson-Deakins Co., 823-824 Chattanooga Bank Bldg. • Chicago 32, Ill.: Lapham-Hickey Co., 3333 47th Place • Elizabeth, New Jersey: A. B. Murray Co., Inc., Post Office Box 476 • Philadelphia 3, Penn.: Rutan & Co., 1717 Sansom St. • San Francisco 10, Calif.: Pacific Metals Co., Ltd., 3100 19th St. • Seattle 4, Wash.: Eagle Metals Co., 4755 First Ave., South • Toronto 5, Ontario, Canada: Alloy Metal Sales, Ltd., 181 Fleet St., East • Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.



2 Tough, lightweight push rods of hardened Bundyweld reduce cam load, increase efficient function of entire valve train. Bundyweld fabricates more easily than the material it replaces, results in more uniform, better finished parts.

Push rods of Bundyweld, long used in powerful truck engines, help improve performance of powerful overhead-type passenger-car engines.

The improved push rods in the overhead engines of some of today's most popular cars are made of lightweight Bundyweld Tubing.

Lightweight push rods of Bundyweld reduce load on cam, and, of course, the entire valve train follows the cam more closely. The design engineer is thus able to produce a more efficient, more powerful overhead engine in keeping with today's constantly growing trend.

The tubing: Bundyweld is the only tubing double-walled from a single

metal strip, with patented beveled edges. It's SAE 1010 steel, copper-bonded throughout 360° of wall contact into a strong, lightweight beadless tubing. Wall thickness and concentricity are uniform, accurate. Ultimate tensile strength, yield strength, and fatigue limit are exceptionally high.

Engineering help: If you'd like help in determining how to apply Bundyweld toward solving your push rod problems, why not talk things over with one of our experienced automotive tubing engineers? You'll find them a prime source of sound information and ideas—not only on push rods but on other tubing applications.

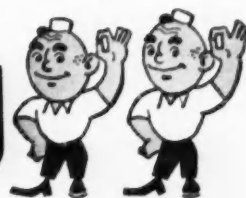
Production: We're already mass-producing Bundyweld for automotive push rods. And, naturally, we're ready to give you the same high-volume, low-cost service we're giving others. We'll ship Bundyweld—cold drawn to proper hardness, held to specified low camber tolerances—right on schedule.

Let us show you what we've done—and what we can do for you—with push rods of Bundyweld Tubing. Perhaps you'd like to check into Bundyweld for your gasoline, oil, hydraulic window or brake lines, too. For details, write Bundy Tubing Company—world's largest producer of small-diameter tubing.

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN

Bundyweld Tubing®

DOUBLE-WALLED FROM A SINGLE STRIP



F-86 Sabre Jet Fighter

(Continued from page 103)

conventional but light enough for good combat effectiveness.

The "flying tail" was a power-controlled geared stabilizer, in which the elevator was geared into the movement of the stabilizer. Advancing this one step farther, a fully powered "slab" stabilizer was incorporated into the D design. In the "slab," the

stabilizer acts as the elevator, and there is no separate elevator surface.

When the Sabre builders produced the F-86F, a fighter-bomber that could drop its external stores to scrap with the MIGs, they produced what may be the world's most versatile fighter-bomber. For in incorporating a bigger engine and refining the design so that large external tanks, as well as ordnance, can be carried—without sacrificing its air superiority capabilities—the F Sabre can play a lead role in air warfare for years. After it has stepped from the Num-

ber 1 spot in favor of such new designs as the new North American F-100, the F may take the spot now held by the sturdy and long-lived P-51 Mustang fighter, which has been a standard "tool" for military airmen of several countries for better than ten years.

Continuing with the Sabre series progression, the F-86G design was a fighter variation. It was dropped in favor of the F-86H program, next in this prolific Sabre line, which will provide improved performance for day fighter and fighter-bomber missions over the F-86F. Here the designers produced almost an entirely new airplane, although the wing is the same aerodynamically as all others in the Sabre series, including the F-86D and YF-93A. In the H airplane, the fuselage is cut horizontally to allow for a new engine with very high thrust, the G-J-73-3. There are other structural changes in the H occasioned by the increased weight and fuel capacity. The intake duct of the H is considerably larger than preceding Sabres and, together with its deeper fuselage, gives this Sabre a different external appearance from others of the famous line.

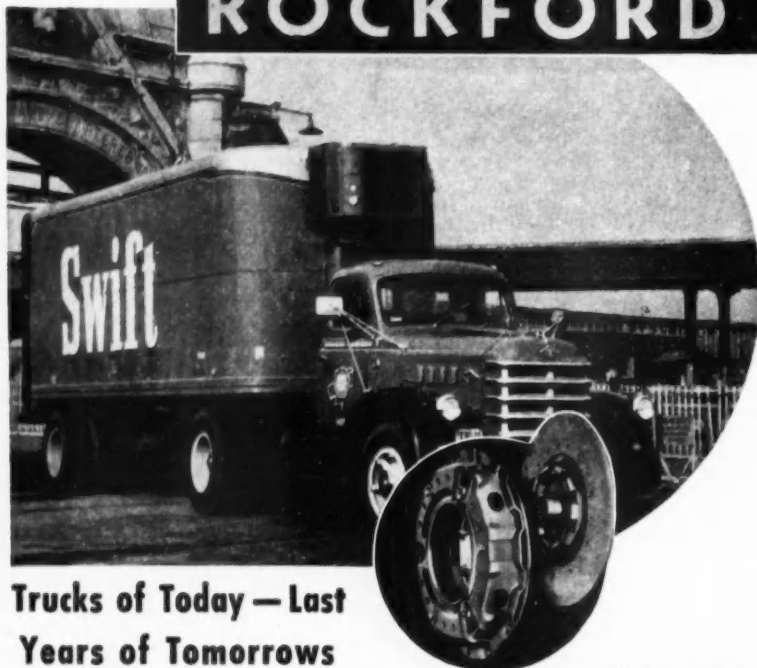
Projecting their "know how" after the extremely successful Sabre series had been fully developed and exploited, North American engineers made studies of a new, advanced type of day fighter. This was originally called the "Sabre 45."

This new airplane, developed by the company on its own, and not a part of any design competition, was accepted by the Air Force as the F-100 and the company is now working on a production order.

New Engine Carton

Chevrolet Aircraft Div. is using a new system of packaging aircraft engines for shipment from its Tonawanda, N. Y., plant. It consists of a re-usable two-piece metal shell large enough to accommodate a complete engine and accessories and fitted with rubber engine mounts for protection from shock in transit. After the engine is placed in the lower half of the shell, the upper half is placed over it and the two-flanged sections are bolted together and sealed with a rubber gasket. The carton is then pressurized to five psi with filtered dry air. Practice during World War II was to package the engines in cellophane bags containing moisture absorbing agents with all air evacuated and the entire assembly crated for shipment. The new steel shells are returned to Chevrolet for re-use.

CLUTCHES by ROCKFORD



Trucks of Today — Last Years of Tomorrows

Today's Diamond-T diesel truck tractor is designed to keep going years longer than usually is expected of a heavy-duty truck. So, the ROCKFORD CLUTCHES that are original equipment in it are built for long, trouble-free service. Let ROCKFORD clutch engineers work with your development department to design successful power transmission controls for your heavy-duty units.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes



capacity tables, dimensions and complete specifications.



ROCKFORD CLUTCH DIVISION

315 Catherine Street, Rockford, Illinois, U.S.A.

BORG
WARNER

Performance
proved with
the
FULLER
ROADRANGER!

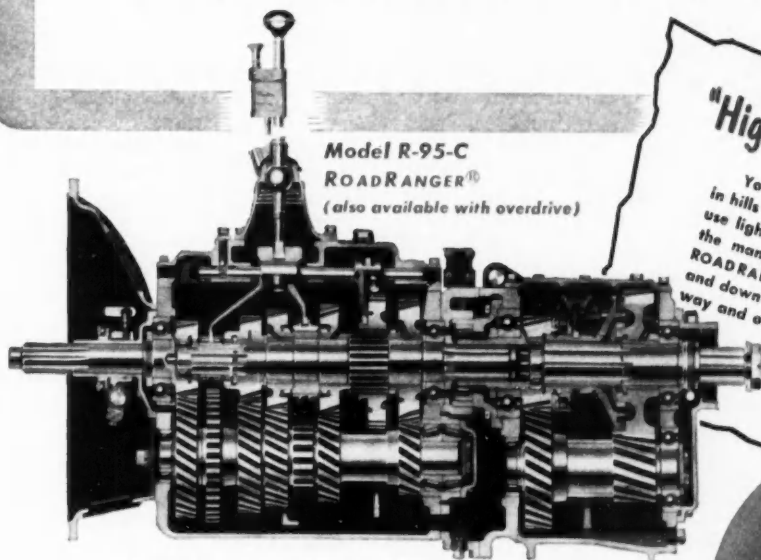


Consolidated Freightways, Inc., of Portland, Ore., is operating 78 Fuller ROADRANGERS out of their Chicago terminal. Each ROADRANGER-equipped White-Freightliner averages 14,000 miles each month on the "main-line" route to and from the West Coast.

Using 165 hp Cummins Diesels, governed at 1850 rpm, and hauling 59,000 lbs. gross,

they are standardizing on the Fuller ROADRANGER Model R-950-C (with overdrive) to step up time in hills and traffic, get more freight on the payload axle.

Fuller ROADRANGER Transmissions pay off for Consolidated in low maintenance costs as well as high average trip speeds—and the operators all sing their praises.



Model R-95-C
ROADRANGER[®]
(also available with overdrive)

"Higher Average Speed in Hills"

You hear it everywhere—"higher average speed in hills... less driver fatigue... more payload... use lighter engines...". And that's just a few of the many things they're saying about the Fuller ROADRANGER. North, east, south, west... in up and down hauling, in dense traffic... on the highway and off... fleet operators are turning to the new efficiency of this 10-speeds-with-one-lever transmission.

They like the ROADRANGER because of these advantages:

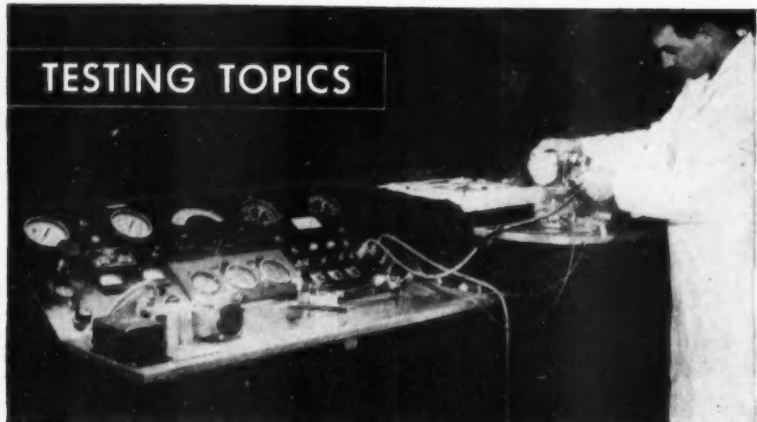
- 1 No gear splitting—10 selective gear ratios, evenly and progressively spaced.
- 2 Easier, quicker shifts—28% steps—one shift lever controls all 10 forward speeds.
- 3 Higher average road speed—engine operates in peak hp range with greater fuel economy.
- 4 Less driver fatigue—1/3 less shifting.
- 5 Range shifts pre-selected—automatic and synchronized.
- 6 More compact than other 10-speeds.
- 7 More cargo on payload axle.



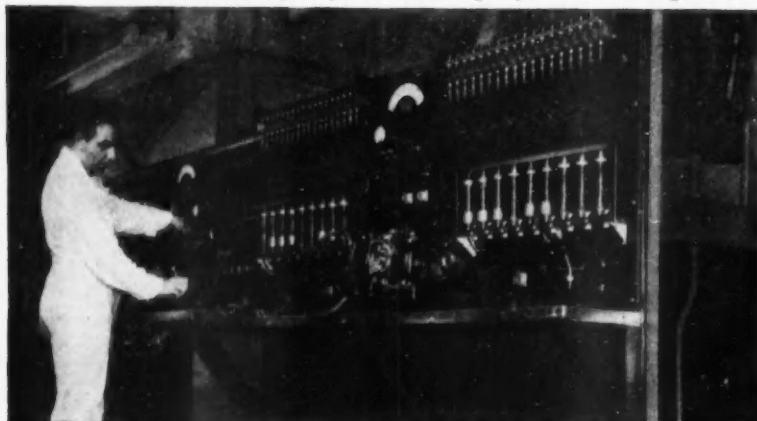
FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO 13F, MICHIGAN

Unit Drop Forge Division, Milwaukee 1, Wis. • WESTERN DISTRICT OFFICE (SALES & SERVICE—BOTH DIVISIONS), 1060 E. 11th Street, Oakland 6, Calif.

TESTING TOPICS



GREER PROPELLER GOVERNOR TEST STAND checks the mechanical "IQ" of the brains behind the performance of hydromatic constant speed propellers. This machine will test double acting, single or double capacity and reversible governors.



GREER HI-LO MAGNETO TEST STAND, above, tests both high and low tension magnetos, distributors, and coils of Pratt & Whitney and Wright Aircraft engines.

Testing the Flying Clippers

Pan American's Miami Overhaul Base Uses Greer Test Equipment

Accuracy! Dependability! Speed! These are the qualities Pan Am seeks in test equipment, and finds in Greer. Greer has simplified and standardized its line to the point where customers can order test equipment right out of the Greer catalog.

Please feel free to call on Greer to discuss any aircraft testing or maintenance problem. If your question is not within our scope, we will tell you where it can be answered. Call or write Greer today.



Greer Hydraulics Inc. 454 Eighteenth St., Brooklyn 15, N. Y.

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GREER AIRCRAFT STARTER TESTER is used for high capacity aircraft starters up to 1400 foot-pounds of torque. Accessories kit permits testing of actuators.

Balancing Driveshafts

(Continued from page 74)

and 3½ in.—are being finished on the production floor together with many different lengths.

A minimum number of steps from tubing to complete shaft have been set up with the least possible amount of manual handling from one operation to the next. Starting off the production floor is a Bardons & Oliver automatic machine for cutting off the necessary lengths of tubing. Next, in line, is a horizontal boring mill—designed and built by Mack—that is utilized for reaming the ID at the ends of the tube. Another operation which fits into the preliminary procedures is the balancing of the yokes. These are statically balanced to ¼ oz in.

Cut-off lengths of tubing are fed to a 25-ton Williams & White horizontal hydraulic press by a gravity type conveyor. Here, the driveshaft tubing, universal joint and spline stub are loaded into the press for assembly. The press equipment can readily be adjusted for various lengths and pressures.

Another machine of Mack design then is used for automatic submerged arc welding procedures on the drive-shaft. This machine consists of a Reeves drive, an automatic Lincoln arc welding head, and an Invincible flux recovery unit. Specifically, this machine welds the components and tubing that were pressed together in the previous operation.

The driveshaft then is loaded in a Hannifin press for straightening. For this operation, Mack engineers developed a special table and tooling. When the straightening operation is completed, the driveshafts have no more than a 0.005 in. indicated runout.

Last operation on the driveshaft production line—and one of the most interesting—is carried out by a German-made Trebel balancing machine. With this unit, which was supplied by Kurt Orban Co., Inc., New York, N. Y., driveshafts are balanced from 0.75 oz in. to 4.00 oz in. depending upon the size of the shaft. Normal balancing speed of the 96-in. capacity unit is 500 rpm, but the shaft is turned up to 3800 rpm for checking purposes. If any vibration occurs during the test, the driveshaft is checked to 0.2 oz in.

In operation, the work — driven from the face plate — rotates on spe-



A Night "Hold-Up"

Suddenly, out of the black, a masked "desperado" appears, thoroughly engrossed in his escapade...completely unmindful of the wheeled danger that rolls toward him. But a sure, split-second stop is made—thanks to the sharp, twin-beams of the back-up lights that stab through the darkness.

Your back-up lights, first developed by the C. M. HALL LAMP COMPANY, work for you surely and automatically everytime you put your car in reverse gear. They team up with other modern vision-aids to make your motoring safer and easier.

The C. M. HALL LAMP COMPANY also manufactures over 200 other kinds of lighting equipment. Since 1909, they have worked hand-in-hand with America's leading automotive manufacturers making many major contributions to Vision for Transportation.



Bright-spot in the Transportation Center?



Vision for Transportation

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DETROIT 7, MICHIGAN

and its wholly-owned subsidiary INDIANA DIE CASTINGS, INC. ELWOOD, INDIANA

cial balancing flanges developed by Mack engineers. The machine works on the principle of introducing a counter motion into the bearings in which the piece rotates until a smooth running condition is obtained. At this point the machine indicates the magnitude as well as the location of unbalance in the driveshaft. When weight is required, the operator spot welds slugs on the tube.

For the actual balancing of the shaft, the operator locks one of the nodal bars (see illustration) to determine the amount of unbalance at each

end of the driveshaft. When the phase of counter vibration is adjusted by the operator to be opposite to, and the magnitude the same as the unbalance vibration, the motion of the bearing leverage will cease. The unbalance condition of the rotating workpiece forces the leverage

down, while the counter force is directed upward. At this point of equilibrium an indicator shows the exact amount of counter force that is necessary to bring the driveshaft into balance, and a marker points at the exact angular position at which the weight has been applied.

Problems of the AUTOMATIC FACTORY

(Continued from page 41)

The handling of cumbersome parts manually can, at times, become quite

hazardous even with the best safety devices. Use of automation to handle stampings into and out of presses and at turnover operations for many parts are good examples of this type.

SUBMERSION UNNECESSARY DISTORTION ELIMINATED

Any part can be tested for leaks without distortion or submersion with the



WHITTINGTON

VACUUM TESTER



- Tests Accurately, Quickly and Safely
- No Submersion, Eliminates Clean-up
- Flanges and Sealing Pads Designed Exclusively to Fit Your Part.

Parts with many openings, previously very difficult to test for leaks, can now be tested quickly, easily, safely with the Whittington Vacuum Tester . . . without fear of distortion or corrosion associated with other testing methods. The part is not submerged in water, which eliminates costly "clean-up" and additional machining. The highest pressure to which a part is subjected is less than atmospheric pressure. For the best solution to any leak detection problem contact . . . Whittington.

Gentlemen: Please send full details on the WHITTINGTON Vacuum Tester.

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Address.....
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Disadvantages

In discussing automation with others in manufacturing from other industries, we very often find that there are disadvantages which appear as stumbling blocks to the use of automation. We usually find that these disadvantages have not been analyzed to their fullest extent in evaluating the program. To help understand the subject thoroughly, I would like to bring out these items briefly.

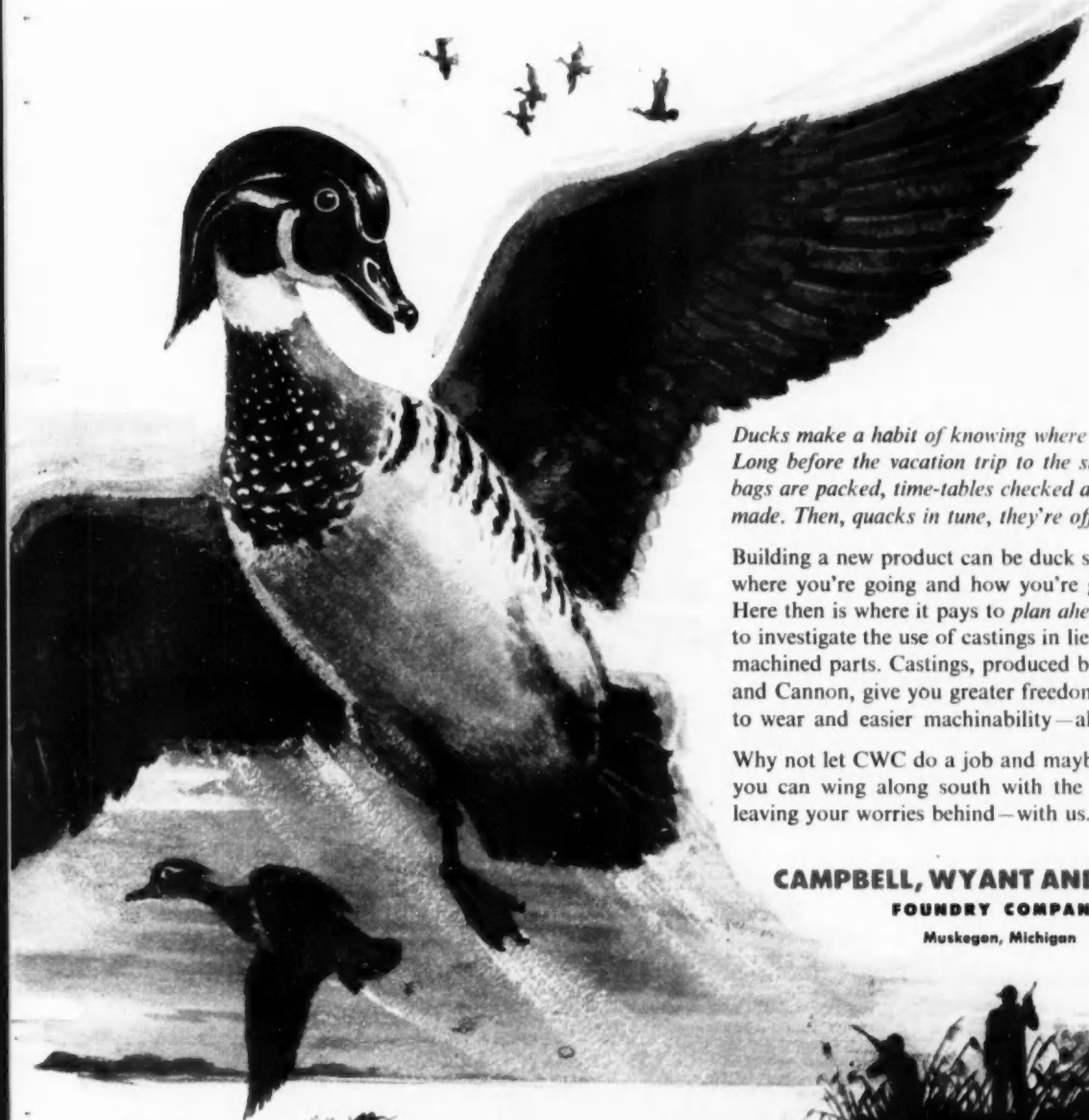
The question of maintenance costs is usually brought up in discussing automatic equipment. Use of automation devices in the production processes naturally causes maintenance problems which could offset the savings to be made if not properly handled. Many departments have become nearly 100 per cent automatic. Because of this, any breakdown of even the smallest element can shut down the entire line. This maintenance problem has been minimized as skill in automation design has increased. We have simplified the details of the systems. Many of the devices have been made more substantial and preventive maintenance has become a must in our plants.

Engineering costs, of course, are common to all engineering endeavor but are especially important here because of the need for coordination of so many elements such as plant layout, tool design, die design, machine tool builders, material handling engineering, and others. Three-dimensional models are sometimes developed and more often perspective drawings are made as part of this plan.

Installation costs are normal in considering any piece of production equipment. In studying existing operations, however, an unusual problem arises. It is often necessary to

(Turn to page 114, please)

YOU'LL NEVER SEE
a duck flying blind



Ducks make a habit of knowing where they're going. Long before the vacation trip to the sunny clime, their bags are packed, time-tables checked and reservations made. Then, quacks in tune, they're off.

Building a new product can be duck soup when you know where you're going and how you're going to get there. Here then is where it pays to *plan ahead*... taking the time to investigate the use of castings in lieu of more costly machined parts. Castings, produced by Campbell, Wyant and Cannon, give you greater freedom of design, resistance to wear and easier machinability—all at much less cost.

Why not let CWC do a job and maybe next time you can wing along south with the ducks, leaving your worries behind—with us.

CAMPBELL, WYANT AND CANNON
FOUNDRY COMPANY
Muskegon, Michigan

CWC

Since 1908



**GEAR CUTTING
GEAR FINISHING**

**Complete Equipment
For Gear Production**

**GEAR LAPPING
GEAR CHECKING**

*Model 18105 Shear-Speed Cuts
Costs at Caterpillar*

ONE SHEAR-SPEED* CUTS CATERPILLAR CLUSTERS



... in $\frac{1}{8}$ the time!

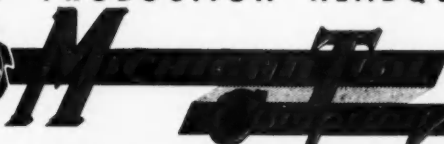
In ONE HOUR, one SHEAR-SPEED shaper cutter cuts as many teeth on these final drive gear and pinion clusters as were cut by previous methods in EIGHT HOURS at Caterpillar Tractor Co. Less floor space is required, and the Shear-Speed has no trouble keeping up with production requirements. Both gears are cut on the same Shear-Speed.

The blank weighs 70 pounds—20 pounds of metal is removed in cutting the teeth. Cutting time for the 10.372" diameter, 27 tooth gear is 7.5 pieces floor to floor per hour; the 12 teeth on the 6.097" diameter pinion are cut at the rate of 6.5 gears per hour.

Twenty-one complete gears were produced in 8 hours by previous standard hobbing and shaping methods on 6 machines. Diametral pitches are 2.750 on the gear and 2.413 on the pinion. Face widths are $2\frac{1}{16}$ " and $4\frac{1}{16}$ ".

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MEET EVERY NEED

... in sanding, polishing and cleaning up.

CLEVELAND ABRASIVES give long wear, and their constant cutting surface means improved performance!

Whether the job be great or small, Cleveland Abrasives save time, money and effort.



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Cleveland Container Canada, Ltd., Prescott, Ontario • Offices in Toronto and Montreal



(Continued from page 110)

rearrange machinery. This can be an expensive operation. However, we have found many cases of this kind where the advantages to be gained made this type of program possible. Proper planning can make the installation of automation devices occur at model change time when rearrangements are often necessary due to changes in processing.

Every product studied requires special consideration. We manufacture a wide variety of parts of different sizes and shapes and the machinery and production equipment we utilize varies in size. Our present setup of proper emphasis on automation makes it possible for us to study the problems at the beginning of new programs so that standardized automation devices can be used to minimize this problem.

How It Works

In order to indicate the work required, I would like to explain how we handle a new program. At the present time, we have people in our company who are specialists and concentrate on automation design work. An automation designer must have imagination, engineering knowledge, and design experience; and must think in terms of equipment which very often is a compromise between the comparatively loose standards used for designing a conveyor and the close standards utilized in normal tool and die design. This is the type of man who starts analyzing a program in the first step when the general plant layout has been agreed upon and detailed layouts are in their early stage.

We ordinarily give one automation engineer responsibility for the work on a complete part. As the detailed plant layout is developed, the automation man must be readily available for consultation so that arrangements can be made for the installation of the simplest possible transfer mechanism. At this point in the process many interested parties from production and higher management view the developments to see the overall plan.

It is the time for quick calculations and simple sketches to help determine in a preliminary way the extent of automation which is justified by the economics and other related factors. We quite often find that the right type of automation equipment costs very little more than standard conveyances which must be supplied as a minimum. We can see here the value of close coordination on the

(Turn to page 116, please)

Power for Power-Steering

EATON ROTOR PUMPS

*Now in production on 10 passenger cars,
and used by
other manufacturers
for transmission, lubrication,
and hydraulic control*



For your new models—advanced low-cost design,
reduced horsepower requirement, new systems.

EATON MANUFACTURING COMPANY

General Offices: CLEVELAND, OHIO



Pump Division



9771 French Road • Detroit 13, Michigan

program at this point and it must be strongly emphasized.

The part to be produced must be carefully studied for adaptability to automation. Preliminary manpower estimates must be considered. We may find that one operator can load and unload several or more machines, or may be required for reasons other than loading and unloading such as assembly, manual control, observation, or others; and automation may not be necessary.

Once we decide on the plant layout to be used, copies are made and the

automation engineer starts his detailed study for determination of the complete program. An overall preliminary automation layout is made. It shows all of the elements required. In some cases models and three-dimensional drawings are made to be certain of some of the details and to make proper presentation to management for approval.

This preliminary automation layout is then analyzed for estimated installed cost.

Our Industrial Engineering Dept. analyzes the manpower requirements for the entire layout both with and

without automation. When these are completed, we then have cost figures which enable us to make a proper decision as to the extent of automation which may be required. This data is summarized and presented to management for approval.

Revision

When the program is approved the really important work begins. The plant layouts which were developed must be revised wherever necessary so that the automation equipment is allowed adequate space.

The Processing Dept. revises to operation sheets where necessary to include the effects of the automation equipment.

The Tool and Die Design Dept. is consulted so that proper coordination takes place. It is important that clearances are left in dies and tools for introduction of automation devices to load and unload work.

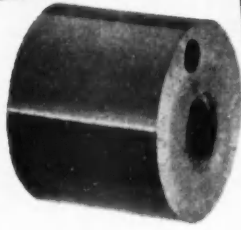
The machinery and equipment builders are consulted so that work heights are standardized and they realize the type of program which is being planned.

At this point it is possible to make a final automation layout and we are ready to proceed with the procurement of the equipment.

Responsibility

In the development of automation at Ford we have procured equipment in several ways. One way was to do the design work within the company, write the necessary specifications and then to procure the equipment from outside builders who would install the units. This often resulted in split responsibility for design, construction, and installation. We are working towards a program in which the contractor shall completely design, fabricate, deliver, and install all of the automation equipment including testing before it is accepted by the company.

Inasmuch as automation equipment is a key item in a production process, we feel that the method of placing all of the responsibility with one party is a much better one if it can possibly be utilized. Even assuming that this method is utilized, the automation program is incomplete until the job is actually operating successfully. For this reason the automation engineer must continue to follow the program until the entire system is in operation. It is necessary to keep in close touch with field conditions to take care of minor changes which



Eclipse-Pioneer*
triples balancing output
of air-pump rotors
with TREBEL BALANCER

Rough balancing increased from 3.1 to 9.6 per hour
Fine balancing increased from 3.15 to 13.1 per hour

*Division of Bendix Aviation Corporation

Locate unbalance in your rotating parts this fast, simple way

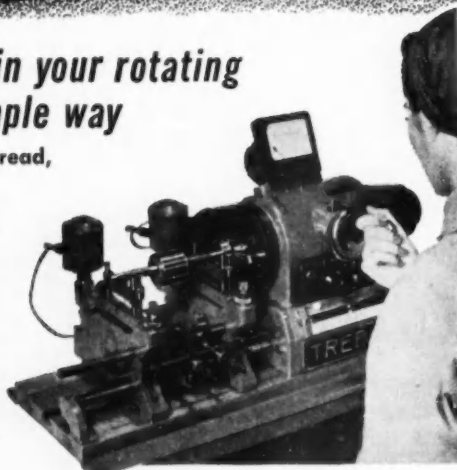
Takes less than a minute to read,
2 minutes to set up.

No special skills are needed to detect the unbalance that causes vibration in rotating parts . . . when you use the TREBEL DYNAMIC BALANCER.

The unique TREBEL dynamic balancing principle applies a variable counter-vibration to counteract unbalance vibration. Direct readings in ounce-inches give the amount of unbalance without further calibration; readings in degrees show location of unbalance.

That's why so many leading plants use the TREBEL.

Write for Catalog "B" or see a demonstration in your own plant.

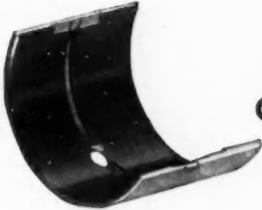


Model 2b-5 Trebel Balancer
Weight capacity 2½ oz. to 4½ lbs.
Max. work diameter 7"; length 18"
Accurate within .00025" displacement of center of gravity
Other Trebel models for work up to 22,000 lbs. and 98½" OD.

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quality control,  quantity production. Widest


range of sizes and lining alloys

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service. Long or short runs for automotive

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Farquhar Hydraulic Press at the Weirton Steel Company straightens stopper rods. It has doubled production, required practically no maintenance.

Farquhar Hydraulic Press at the Weirton Steel Co.

"eliminates breakage of rods...increases production 100%"

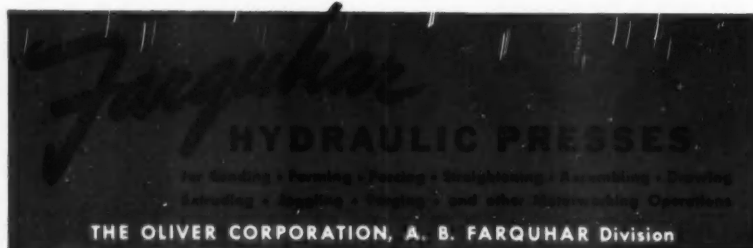
The Weirton Steel Co., Weirton, W. Va., formerly straightened stopper rods with a steam hammer. The operation was slow and resulted in a high percentage of breakage. Seeking a better method, Weirton officials bought a Farquhar Press to speed production. Not only has the press increased production 100%, but it has eliminated breakage of rods. In addition, Weirton reports that in the six years this press has been operating, "practically no maintenance has been necessary."

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in modern production! Farquhar Presses are

built for the job... assure faster production due to rapid advance and return of the ram... greater accuracy because of the extra guides on the moving platen... easy, smooth operation with finger-tip controls... longer life due to positive control of speed and pressure on the die... long, dependable service with minimum maintenance cost.

Farquhar engineers are ready to help solve whatever production problem you may have. Send for free catalog showing Farquhar Built-for-the-Job Presses in all sizes and capacities. Write to THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1523 Duke St., York, Pennsylvania.



may be necessary as the various other items of production equipment are installed in their proper places.

The Economics

Automation expenditures must be expected to produce results in terms of increased production, lower costs, better working conditions, or other benefits. It is important that a true picture of the estimated cost savings and all financial factors are brought out to prevent the expenditure of funds on schemes which sound reasonable or may be spectacular with very little benefit. We in the automobile industry find this problem especially significant since many of our parts become obsolete after one year. In cases of this kind, it is apparent that systems which do not amortize themselves in less than a model year are not economically advisable. We do find that there are many cases in our press lines for body parts, and machining lines for engine and chassis parts, where longer amortization periods are permissible. Very often on some of these parts, the basic system can be utilized for several years inasmuch as the year-to-year changes would not make the equipment obsolete.

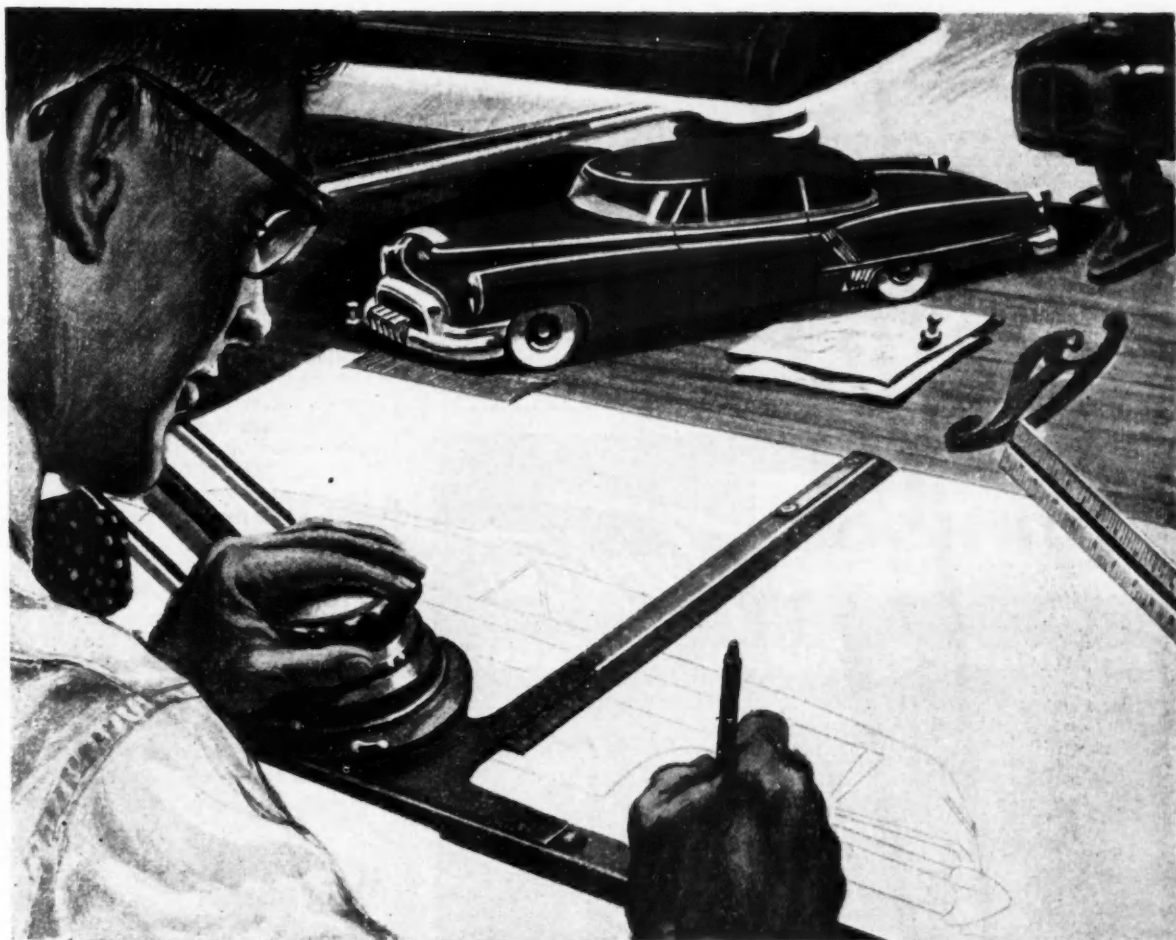
In many cases correctly designed automation equipment costs very little more than minimum standard conveying devices. Because of this, automation thinking must be brought into a program from its inception.

Reallocation of Manpower

Our discussion of the factory with automation brings out the fact that our production processes are becoming much more complicated. We have been successful in many cases in removing that portion of the labor which was largely devoted to manual handling of parts. When we do this, our production processes very often become a series of departments producing different parts which are in effect one large transfer machine.

When we select the men required to run these departments we are more concerned with their ability to keep them in first-class condition and to recognize when troubles are threatening.

In general, production people will be more highly trained on the average than in the past. To attain the type of worker required, it will be found that the scarce skills are not ready-made. The factory management of the future must be prepared to assist in this training program. The reward to the worker will be that



Makes automotive dreams come true

In the automotive industry, as in countless others, OSTUCO Tubing has what it takes to transform drawing board dreams into practical realities—infinite adaptability, great strength, light weight, and low cost.

Here are a few applications in passenger cars, trailers, buses, and trucks: Steering post columns, shock absorbers, bumper guards, mirror and light supports, piston pins, connecting rods, bearings, bushings, radiator and tank fittings, exhaust parts, radius rods, seat

frames, sleeves, axles, and carrier racks.

Leading designers and manufacturers in practically every field specify OSTUCO Tubing, seamless or electric welded, because OSTUCO manufactures, forges and fabricates all at one plant . . . and because OSTUCO is famous for consistent highest quality.

It will pay you to consult our experienced engineers about OSTUCO Tubing for your current needs or for redesigning your products to meet future competition.



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Manufacturers and Fabricators of Seamless and Electric Welded Steel Tubing
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jobs will be less monotonous and boring and that, if properly trained, he will become more interested in his job.

Behind the production worker we will find more highly trained technical people. The greater complexity of our operating production lines necessitates this.

As we can see from the development of our own Automation Dept., a higher skill was necessary in designing the equipment involved than was formerly needed for the comparatively simple devices such as roller convey-

ors, simple belt conveyors, and other similar items which automation replaced. Specialization among technical people will, in many cases, become more pronounced; but it will be necessary for the various engineering groups to understand the problems of the other departments. Because of this, you will often find the need for supplementary training for the engineering specialists.

We can sum up the manpower situation in the factory of the future by saying that there will be a much greater use of brain power throughout the entire plant to replace a large por-

tion of the muscle power which we have been accustomed to in the past.

Management

The factory with automation which we are talking about today and which now exists in important segments, represents the maturity of manufacturing methods. This maturity which is accomplished by the utilization of the best of engineering thinking has coincided with the greater utilization of specialists throughout the manpower structure of our plants. This, of course, means a larger number of individual departments working on the development and operation of new facilities. With this has come a much greater reliance on detailed studies to obtain all of the facts about proposed modernization and expansion programs.

This combination of factors places a new emphasis on the management of our factories. The top management of our plants must be able to promote teamwork in the entire organization in order that all phases of production planning are coordinated. Plant management must keep itself flexible to make the best out of the various technical skills available for planning purposes.

The Future of Automatic Processes

We have installed successful systems in many of the divisions of the company. The Cleveland Engine Plant has the latest in engine manufacturing facilities in the automotive industry. We have gone as far in this plant as it was practical to go at the time the plant was developed. You will find that in several cases, we have not hesitated to set up departments with automation throughout. We have been in operation for nearly a year and the results so far have been entirely satisfactory.

The use of transfer machines and automation are with us because they are a necessity to keep our costs down. To forecast the future, we can only call upon our past experience and our current successes. As we pointed out, it was only a few years ago when our processing was on the basis of a series of individual machines each doing one small operation. Our automation engineers devised means of tying these standard facilities together so that manual handling could be eliminated in many cases.

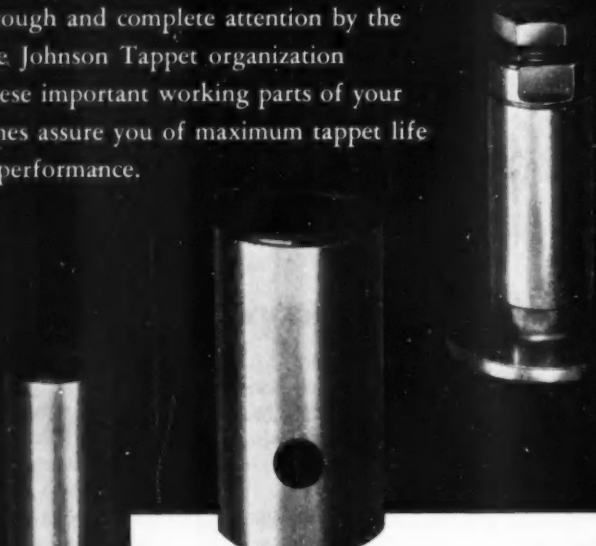
The use of automation in our manufacturing plants is a trend which has started and which we feel will con-

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Originated by Johnson this diaphragm type Self Locking Tappet Screw is operating successfully in millions of cast iron and steel tappets.



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JOHNSON PRODUCTS

INC.

MUSKEGON, MICHIGAN

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**High Strength
with Excellent
Cold-Forming
Properties**



DECK HINGE

N-A-X HIGH-TENSILE, having 50% greater strength than mild carbon steel, permits the use of thinner sections—resulting in lighter weight of products. It is a low-alloy steel—possessing much greater resistance to corrosion than mild carbon steel, with either painted or unpainted surfaces. Combined with this characteristic, it has high fatigue and toughness values at normal and sub-zero temperatures and the abrasion resistance of a medium high carbon steel—resulting in longer life of products.

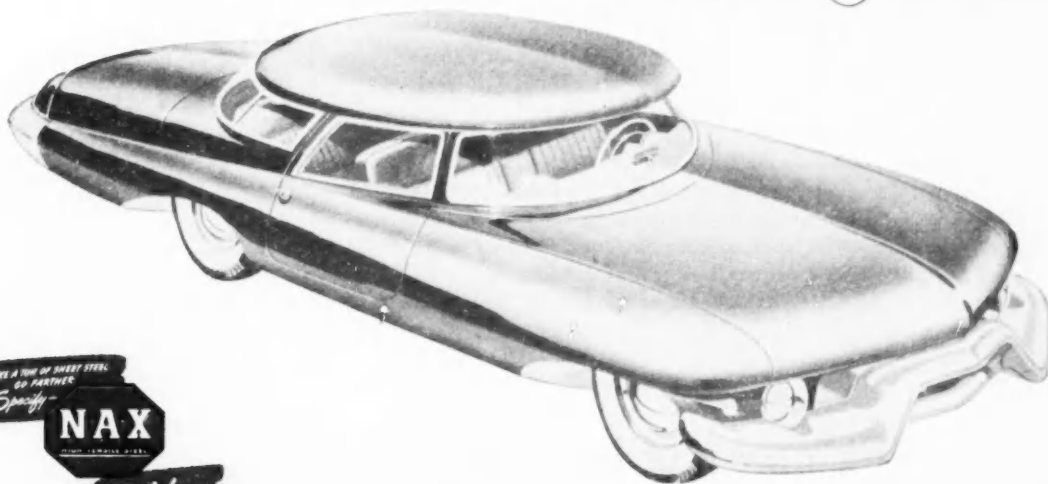
N-A-X HIGH-TENSILE, with its higher physical properties, can be readily formed into the most difficult stamped shapes, and its response to welding, by any method, is excellent. Due to its inherently fine grain and higher hardness, it can be ground and polished to a high degree of lustre at lower cost than can mild carbon steel.

Your product can be made lighter in weight . . . to last longer . . . and in some cases be manufactured more economically, when made of N-A-X HIGH-TENSILE steel.

GREAT LAKES STEEL CORPORATION

N-A-X Alloy Division

Ecorse, Detroit 29, Mich.



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DUMORE DRILL HEADS

cut small hole drilling cost 75%
..multiply production 4 times!



Foot treadle leaves operator's hands free for loading and unloading jig. Drill Heads are used in tandem, drill .086" dia. holes with No. 44 drill. Material is 0-25 Armco Zinc-grip.

Metal window manufacturer drills 600,000 holes yearly with these amazing tools!

THE world's largest manufacturer of all-metal combination screen and storm sash installed 2 Dumore Automatic Drill Heads . . . got these almost incredible results. (1) 600,000 instead of 150,000 holes drilled per 2000-hr. shift-year. (2) Cost per 1000 holes decreased from \$23.00 to \$5.60. (3) Drill breakage reduced to the point where savings paid for the Drill Heads in 13 months.

And the most amazing thing about this report is that it is not an isolated case. In fact, increased output and similar savings on costs of production, scrap loss, and reductions in down-time, are being effected in practically every instance where Dumore Automatic Drill Heads have been installed. As this manufacturer says, "They are a 'natural' for multiple drilling operations."

To get an idea of how these amazing tools can help you improve your production and cut your costs, see your industrial distributor, or write:



THE DUMORE COMPANY
1339 Seventeenth Street • Racine, Wisconsin

tinue and expand. The future will certainly find a much greater use of the knowledge which has been obtained within the past few years. We are certain that increased management attention, engineering thought, and coordination will keep this trend going and extend it substantially for the maximum benefit to all.

The foregoing is an abstract of a paper presented by the authors at the 1953 SAE National Production Meeting held late last month at Cleveland.

New Products

For additional information please use postage-free reply card on page 65

(Continued from page 64)

Nickel Plating Process

Recently announced is a process of nickel plating which is said to require no electrolytic equipment. Called Kanigen, it reportedly will plate any article uniformly, regardless of size or shape, and has proved satisfactory for the production-line plating of steel, copper, brass, bronze, stainless steel and aluminum.

Kanigen plate is a non-porous, nickel-nickel phosphide composition. Normal Kanigen platings run about five to eight per cent phosphorus and have a Vickers hardness of 550-650. General American Transportation Corp.

Circle P-9 on page 65 for more data

Rust Remover

Now on the market is a product known as Metal Treat for the removal of rust on the chrome trim of cars. It also can be used on machinery, tools, and other metal surfaces.

When used as a pre-primer, the preparation is also said to prevent rust and assure better paint adhesion. The Klean-Strip Co., Inc.

Circle P-10 on page 65 for more data

Sheet Metal Protractor

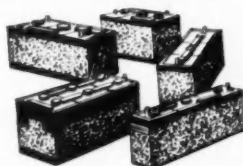
Now in production is a protractor for measuring angles on sheet metal parts. Called Angle-Chek, the device is said to permit quick checking of angles on parts formed by equipment such as hydraulic presses and brakes. Sheridan-Gray, Inc.

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Globe batteries are custom-built for mass distribution under the

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WHAT ***Life-Line*** REALLY DELIVERS IS MORE SERVICE...LESS SERVICING

What Life-Line really delivers is

...more service

...less servicing

"We can't afford equipment breakdowns. We manufacture ice cream making machinery and operate franchise stores throughout the country. Store operators know very little about maintenance. We *must* select equipment that assures trouble-free performance with minimum maintenance. That's what Life-Lines give us. That's why we standardize on them."

The above statement by the chief engineer of an eastern manufacturing plant tells the Life-Line story best. Summed up it means more service, less servicing, with Life-Lines.

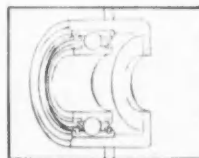
Take the Life-Linestarter, for example. Contacts last longer because exclusive "De-ion*" arc extinction snuffs out arcs fast . . . reduces contact pitting. Simple seesaw balance of clapper prevents accidental opening; kickout spring prevents accidental closing. Compare with any other starter and see why Life-Linestarters offer *more service with less servicing*.

The Life-Line motor's advance design completely eliminates periodic lubrication. Pre-lubricated factory-sealed ball bearings need no greasing attention. Further, steel construction cuts breakage from rough usage. Superior insulation and winding techniques lengthen electrical life. On-the-job reports of a half million Life-Lines show why you get more service with less servicing.

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YOU CAN BE SURE...IF IT'S
Westinghouse



MOTOR

Needs no lubrication. Pre-lubricated factory-sealed bearings eliminate troubles due to under or overlubrication, dust and dirt.

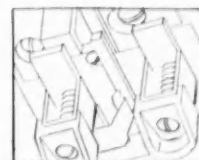


Cuts winding burnouts. Pear-shaped slot design eliminates pockets. No corner voids remain to collect dirt, moisture.



STARTER

Never jams. No sliding surfaces to wear—no sticking—no jamming—nothing to wear or replace.



Never needs filing. Silver-to-silver contacts eliminate filing. Discolored silver maintains high conductivity.

Swiss Automobile Show

(Continued from page 37)

model, a three-speed synchronized transmission is fitted, but provision is made for the Laycock-De Normanville overdrive to be furnished as an extra.

Just returned from the United States, Sir John Black, president of the Standard Co., announced that a smaller car would appear sometime during the year. It is understood that it will be marketed in America

by the Willys-Overland organization at around \$1,498. The Willys Jeep will be manufactured in Coventry and will be sold by Standard in the British Commonwealth, Western Europe and Southern Asia. Standard displayed a new Triumph two passenger sports runabout having a 122 cu in. engine and embodying an entirely redesigned body, the front end of which has been radically changed.

Only detail modifications marked the European cars, and these usually were applied to body trimming and equipment. In a few cases British makers had appealed to Continental designers for the styling of their sports cars, and in one case the British and the Continental types were shown side by side as if to present a contrast. Jaguar, Rolls-Royce and Bentley, who are now using American automatic transmissions, did not present these at the Geneva show. To the eyes of the Continental visitor there were more novelties on the American stands — representing the entire national industry — than at the European booths. In every case the 1953 American models were on exhibition. General Motors and the Chrysler group have their own assembly plants in Switzerland. Ford can draw from U.S.A., England, and Germany. Cunningham showed one sports car with a Chrysler engine and an Italian-built body. As Swiss import duties are based on weight, there is comparatively little inducement to assemble locally.

German representation was strong, but presented little that was new. Volkswagen, one of the largest sellers in this territory, has brought the model up-to-date by a four-speed synchronized transmission. Two new sports versions of the Volkswagen came from the Denzel Co., of Vienna, one of these being in the 1100 cc and the other in the 1300 cc class. Respective power outputs are 38 and 45 hp. Fitted with two carburetors and having a compression ratio increased to 7.5, they constituted well streamlined, two-seater competition runabouts.

After a temporary withdrawal to the Argentine, Cisitalia of Turin returned with a car powered by a 116 cu in. four-cylinder engine with a compression ratio of 8 to 1, and stated to develop 80 hp at 4500 rpm. It features a fluid coupling, a five-speed transmission, two-piece open drive shaft, independent front suspension and semi-elliptic springs at the rear.

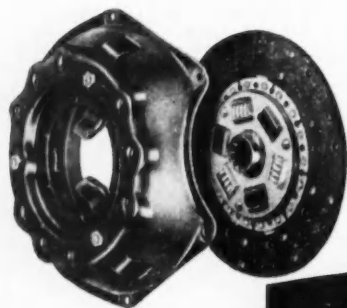
Sweden presented the Saab 92, an integral construction, front drive, four-passenger car on a 97 in. wheelbase. It has a two-cylinder, water-cooled, two-stroke engine of 44.6 cu in. piston displacement, developing 25 hp at 4000 rpm. This car incorporates transverse mounting of engine and transmission. Light alloy is used throughout the engine and curb weight of the car is 1920 lb.

Motorcycles apparently have a big hold on the Swiss, judging by the large number of machines of all types, from all countries, displayed.

(Turn to page 128, please)

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CLUTCHES... for that vital spot where power takes hold of the load!



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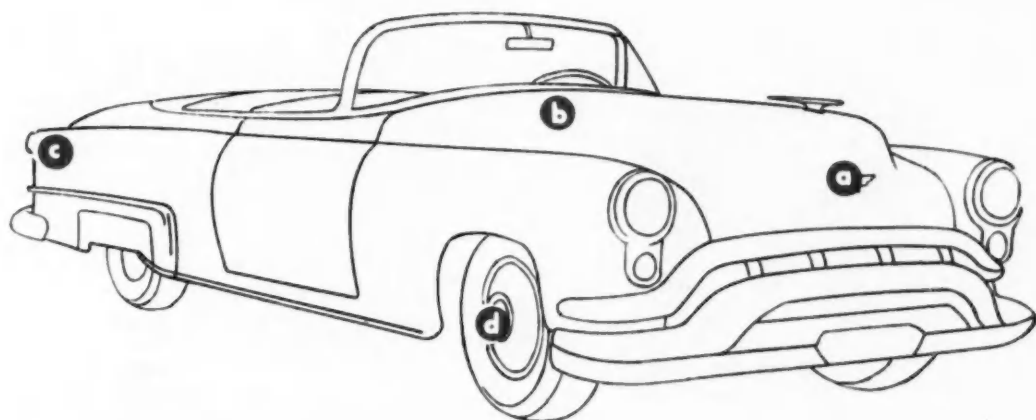
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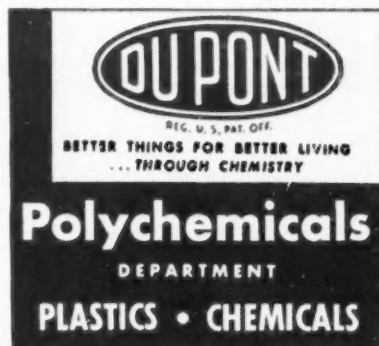


A proven material for automotive styling... **DU PONT** **LUCITE***

Forward-looking engineers are finding in Du Pont "Lucite" acrylic resin the combination of properties that makes possible many of their new designs in improved styling. Beautiful "Lucite" offers optical clarity, outdoor durability, shatter-resistance, strength and unique "edge-lighting" properties.

A few of the many examples in which these properties have been put to use are shown. Perhaps Du Pont "Lucite" and other members of the Du Pont family of plastic engineering materials can help you blueprint your ideas for the future. For full information, write: E. I. du Pont de Nemours & Co., (Inc.), Polychemicals Department, Room 174L Du Pont Bldg., Wilmington 98, Delaware.

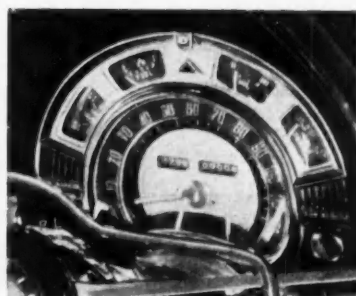
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AUTOMOTIVE INDUSTRIES, April 15, 1953



a HOOD AND TRUNK MEDALLIONS show the beautiful three-dimensional color effects that can be obtained with durable "Lucite." In normal use Du Pont "Lucite" is unaffected by gasoline or lubricants.



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c TAIL-LAMP LENSES of "Lucite" combine eye-catching beauty with outstanding optical properties. "Lucite" may be molded in intricate shapes. It is strong and shatter-resistant... has good dimensional and color stability.



d HUB-CAP EMBLEMS inset with gleaming "Lucite" add a touch of distinctive styling that customers appreciate. Durable "Lucite" insures lasting beauty despite close-to-the-road service and constant exposure.

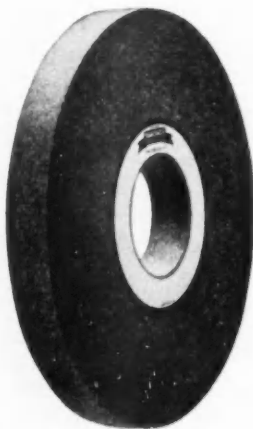


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SIMONDS ABRASIVE CO.

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It's Simonds Abrasive Company bulletin ESA 191 "Cylindrical Grinding Wheels" with recommended specifications—plus facts about feeds, speeds and wheel sizes. It's part of a complete library on Simonds products including wheels for rough grinding, finishing, cutting off, sharpening . . . abrasive polishing grain . . . mounted wheels and points . . . surfacing segments . . . everything you need for productive, economical grinding, factually described and supplemented with helpful hints. Write for ESA 191 . . . or for information on Simonds wheels for other grinding jobs. We'll also send name of your Simonds distributor.



SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES, CHICAGO, DETROIT, BOSTON

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(Continued from page 126)

The K.L.W. autoscooter built in Germany, has a single cylinder, two-stroke engine of only 7.5 cu in. piston displacement, driving the front wheels through a three-speed transmission. With a two-passenger runabout body, windshield and hood, curb weight is 360 lb.

Swiss automobile production is limited to a reduced number of firms specializing in trucks. Saurer, the oldest and most important, showed a supercharged longitudinally-mounted rear Diesel in a bus, designed to carry 26 seated passengers. The four-cylinder supercharged engine of 4.5 by 5.5 in. bore and stroke, is practically all aluminum-alloy construction, with the exception of the one-piece iron head, and develops 110 hp compared with 90 for the unsupercharged model. On the left-hand side of the crankcase a belt-driven, displacement type blower is mounted. The air is passed through a ribbed conduit to the light-alloy valve cover which has the intake manifold cast integral with it. The top of the valve cover is a sheet metal pan held down by a couple of screws. Cylinders are fitted with centrifugally cast wet iron liners.

This bus is of semi-integral construction, the chassis frame members being built up of light-gage sheet steel forming beams, with a body frame in steel, to which light-alloy paneling is attached. Total weight is 16,720 lb. A two-speed rear axle is fitted, giving eight forward speeds and two in reverse and, being intended for Alpine routes there are three distinct brake systems. These are: hydraulic and compressed air on the four wheels; mechanical brake on the rear wheels; and exhaust braking.

With a view to replacing unprofitable local railroads, Saurer is producing a coach fitted with an eight-cylinder supercharged, rear mounted 200 hp Diesel. It has a two-speed axle and hauls three passenger-carrying trailers. The coach has a width of 98 in. and a length of 472 in. Compressed air is used for braking the trailers, as well as for engine starting, operating doors, windshield wiper, etc.

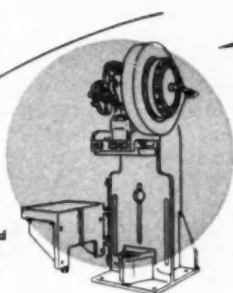
A feature of a four-wheel drive Saurer truck, which has a six-cylinder 125 hp Diesel engine, is the use of a front axle equipped with a first reduction by spiral bevel, shafts with Tracta universal joints, and a final reduction by planetary gears in the wheel hubs. This axle was also shown by Berna, a firm working in collaboration with Saurer.

Four by fours were exhibited by

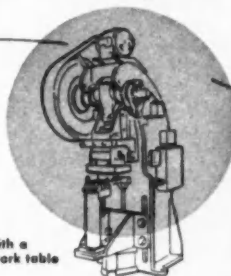
(Turn to page 130, please)

A Multi-purpose Press You Can Keep Busy All the Time

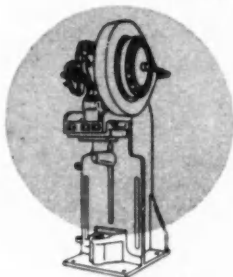
Used as a standard
gap-frame press



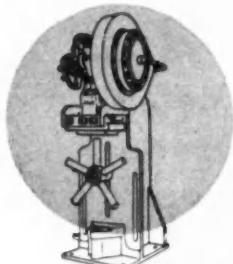
Used with a
traversing work table



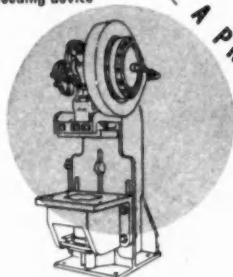
For regular horn
press operations



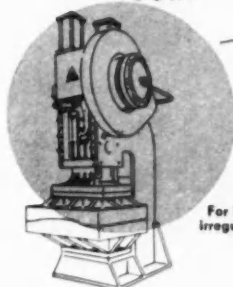
As used with
special feeding device



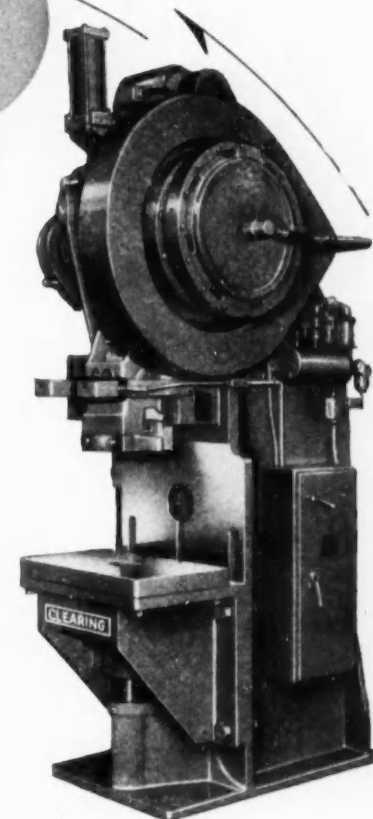
As used with a
die cushion



For large or
irregular parts



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THE WAY TO EFFICIENT MASS PRODUCTION



CLEARING MACHINE CORPORATION, 6498 West 65th St., Chicago 38, Illinois • HAMILTON DIVISION, Hamilton, Ohio

AUTOMOTIVE INDUSTRIES, April 15, 1953

129

(Continued from page 128)

Saurer, Berna, Mercedes, Henschel, Morris, Austin, Renault, Labourier, and by Latil with the four wheels as both drivers and steerers. In the case of Mercedes the 4 x 4 is a development of the L 3500 rear drive model, with a six-cylinder, 90 hp Diesel of 479.47 cu in. displacement. The Morris and Austin vehicles are a civilian application of the types designed for military service.

An underfloor, aircooled, flat eight built by the Swiss Locomotive & Machine Co., of Winterthur, powers a

nine-ton Mowag truck which was exhibited. This is one of a series of aircooled lines ranging from 10 to 250 hp, produced by S.L.M., comprising both four and six cylinder vertical engines and the flat, opposed-cylinder eight. These engines feature light alloy for the crankcase, gear housings and accessories, and separate iron cylinders with an independent head for each cylinder. There is a separate dual-belt driven turbine for each bank of cylinders.

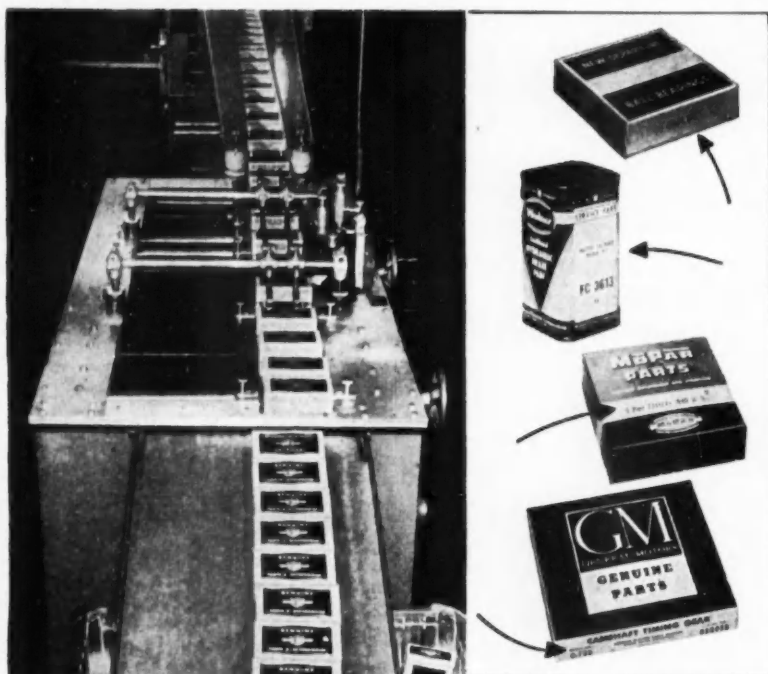
On a six-cylinder Diesel five-ton truck Fiat has adopted a system of

engine exhaust braking, in addition to the standard hydraulic brakes with compressed air application.

Unusual features mark the German Tempo-Matador light truck and coach chassis which were shown. Two large-diameter tubes form the main chassis frame members; these are parallel and widely spaced at the forward half, then sweep together until they almost touch and are united at the rear by two channel section beams. Within these beams the two forked-end axles were pivoted. Suspension is by a pair of coil springs at each side. At the front a broad transverse spring provides suspension. Ahead of this is the driver's platform with pedals and steering column. Behind the spring a conventional four-cylinder engine is set slightly off center, with the radiator by its side, with De Dion drive to the independent front wheels. This layout puts the driver completely forward and provides an engine compartment between his cab and the truck or coach body.

CUT PARTS PACKAGING COSTS

by printing packages as you pack 'em



Here's the most efficient, most economical way to use a common package for a variety of parts or accessories. Print names, numbers, other product identification on one or more blank panels of your package . . . automatically — as it is packed . . . with the Gottscho MARKOCODER. This proved-in-performance printing machine enables you to slash inventories of preprinted packages . . . reduce labor costs . . . cut unit package costs . . . eliminate loss from obsolescence . . . pre-

vent down-time on the line . . . simplify inventory control. (The MARKOCODER package printing method also costs less, is neater and more accurate than labeling or separate-operation imprinting.)

The MARKOCODER prints cartons, boxes, cans, canisters, jars, etc. . . on top, sides, or bottom—synchronizes with speed of production line—adapts to both automatic and manual packaging operations. Quickly adjustable for copy changes, packages of different size.

See the MARKOCODER in action at the Packaging EXPOSITION, Chicago, April 20-23

Gottscho

ADOLPH GOTTSCHO, INC.

Hillside 5, N. J.



Cold Working of Metals

(Continued from page 35)

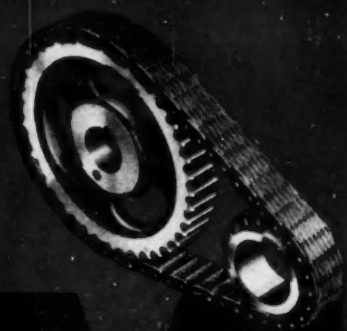
AUTOMOTIVE INDUSTRIES, January 1, 1951.

Commutator Bars

Switching from steel to copper, the latter being a highly critical material as we all know, cold working techniques have been applied in another direction to produce commutator bars faster, more economically, more accurately, and with an important saving in copper consumption. Copper wire of proper size is received in coils, and is processed through carbide dies to produce an extruded wedge-shaped wire. This extruded form then is fed from coils to the National Machine, two-blow header, illustrated in Fig. 5. As shown, two separate coils are fed into the work station where carbide dies finish-form the commutator bar and cut-off to length, two pieces at a time, and at the rate of 250 per minute.

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of
Automotive and Aviation
MANUFACTURING



**We'll be glad
to show you
why**

M=TC

Morse means Timing Chains



(From the Bettmann Archive)

Heavy-duty, chain-driven truck made by Sandusky Motor Company. Date of truck is about 1910—twenty-one years after Morse first produced chains for industry.

Need long-lived, trouble-free timing chain drives?

Need skilled engineering help?

Come to Morse.

In producing over 58,000,000 timing chains for use on autos, trucks, and buses, we've also produced a reputation for the finest timing chains money can buy.

At the same time, we've built up an unequalled fund of engineering knowledge, which we'll be only too glad to put to work for you.

Whatever your needs, we'll be able to supply you with products and services that will show you why M=TC; Morse *means* Timing Chains to the automotive industry.

Send for free print

This is one of a series of old automobile prints that will appear in future Morse advertisements. Write for your free, enlarged copy, suitable for framing for your collection.

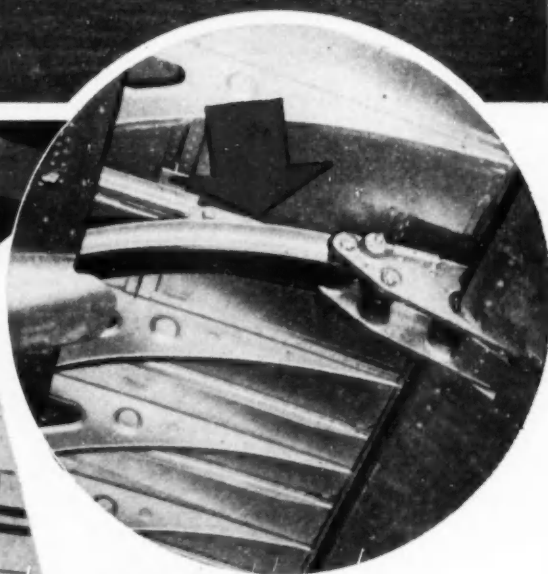


MORSE CHAIN COMPANY

Dep't. 448

7601 Central Avenue • Detroit 10, Michigan

U·S·S CARILLOY Steel in rolled sections



LANDING FLAPS on the Model 340 Convair airliner slide on tracks made of CARILLOY 4140 steel T-sections. These tracks are much stronger than those formerly made from rectangular bars. And they cost 75% less!

lops 4 hours off machining time, provides stronger flap tracks for Convair airliners *and cuts costs 75%*

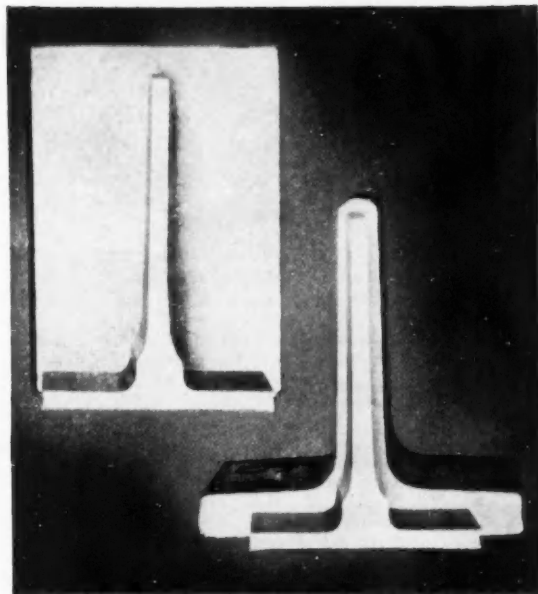
● Wing flap supports for Consolidated Vultee's Model 340 Convair airliners are stronger, cost less, and are of better quality now that they are made from hot-rolled sections of U-S-S CARILLOY steel.

When J. C. Peacock Co., of Los Angeles, California, started making these T-shaped flap tracks for Convair, the accepted practice was to machine them from $2\frac{1}{4}'' \times 3\frac{1}{4}''$ bars of alloy steel. But machining took a lot of time, and more than 50% of the stock metal was wasted in scrap.

Peacock and Convair engineers studied the problem and soon realized that they could shorten machining time and reduce scrap losses by fabricating directly from rolled sections. The question was, where to find a good supply of steel that would meet all the exacting quality requirements? Our Columbia-Geneva Division came through for them, by providing hot-rolled T-sections of CARILLOY 4140 steel.

This steel is giving excellent results. Not only are the CARILLOY parts *stronger* than those formerly used, but they require 4 hours less machining time, and reduce scrap losses 60%. What's more, finished tracks now cost only *one-fourth* as much as they did before.

Our experienced steel engineers and metallurgists may be able to help you make similar savings on *your* products. Call our nearest District Office. Chances are we can supply just the steel and the form you need.



LEFT, the T-shaped cross-section of a flap track in front of a $2\frac{1}{4}'' \times 3\frac{1}{4}''$ steel bar shows how much metal was formerly wasted.

RIGHT, the same flap track in front of the CARILLOY T-section that cuts scrap loss 60%.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

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UNITED STATES STEEL

SCREWS • NUTS • BOLTS

*in a hurry?
need large
quantities?*

**PHEOLL SHIPS
from
HUGE STOCKS**

**give us
a call!**



Do you have production, purchasing, stocking or delivery problems on threaded fasteners? Pheoll... the COMPLETE source... has all the answers! And here they are:

■ Pheoll has 'em... largest in the industry... kept up to level by perpetual inventory controls!

■ Pheoll has 'em... the industry's *most complete line*... by types, head styles, finishes and sizes!

■ Pheoll can generally ship *immediately* on most standard types and sizes!

■ Always available for immediate reply to phone calls, telegrams or letters!

■ Tops for 50 years... kept that way by constant production line and laboratory inspection!

■ Yes! Efficient mechanized order-handling procedures minimize errors and hustle orders along to fast, sure completion!

In every way, *you get better service at Pheoll!* That means less work for you... fewer orders, reduced paper work, less follow-up, simplified stocking. Test Pheoll on your next threaded fastener requirement and see how headaches vanish!

PHEOLL
MANUFACTURING COMPANY



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BOLTS
NUTS

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CHICAGO 50, ILLINOIS

Machine Screws
Sheet Metal Screws
Drive Screws
Cap Screws
Self-Drilling Screws
Phillips Head Screws
Hex Head Screws

Socket Screws
Tapping Screws
Wood Screws
Threaded Rods
Studs, Chain and
Anchor Bolts

Hex Head Bolts
Round Head Bolts
Square Head Bolts
Lag Bolts
Hex Nuts
Square Nuts

Wing Nuts
Lock Washers
Split Lock Washers
Conical Washers
Flat Washers
Cap Nuts
Eye Bolts

News of the MACHINERY INDUSTRIES

(Continued from page 55)

Machine Tool Electrification Forum

Subjects of unusual timeliness featured the program of the 17th Annual Westinghouse Machine Tool Electrification Forum, held in Buffalo, N. Y., yesterday and today, April 14 and 15. Automation from the standpoint of the user—Ford Motor Co., in this instance—and the machine tool builder was given full treatment with emphasis upon automatic work handling between machining operations. Stanley Rice, Heald Machine Co., presented the machine tool side of the picture.

Visualization of programmed tool cycles was brought into focus by H. E. Grimes, The Avey Drilling Machine Co., in a paper describing two practical applications of rotary telephone switching equipment to machine tool control.

Not only machine tool builders but industry as well will be interested in the latest report of the electrical committee of the National Machine Tool Builders' Association, presented by K. B. Rexford of H-P-M. How electrical, hydraulic, and mechanical elements of machine tools are coordinated in a well-balanced design was described by K. O. Tech, chief engineer, The Cross Co.

The open forum discussion session; a session on unique problems and solutions; as well as other topics rounded out this important meeting. S. E. Bergstrom, vice president, Cincinnati Milling Machine Co., and president of the NMTBA, spoke at the luncheon; while T. Fort, vice president, Westinghouse Electric Corp., was the banquet speaker.

As usual, a condensed report on the technical papers will appear in a subsequent issue of AUTOMOTIVE INDUSTRIES.

Civilian Tool Orders Offset Defense Dip

Stepped up buying of machine tools by civilian manufacturers is plugging the gap caused by reduced purchasing for defense production. New orders during February jumped 12 per cent over the preceding month, with more than half the total accounted for by manufacturers of civilian goods. February orders are valued at almost \$85 million. Also encouraging was the

(Turn to page 142, please)

"U.S." Research perfects it...

"U.S." Production builds it



In the great laboratory in the United States Rubber Company plant at Fort Wayne, scientists and engineers are working on problems involving rubber-to-metal parts and plastic parts for the automotive industry. They have at their command one of the most modern and extensive laboratories in existence — equipped with all the latest research and development facilities. "U.S." RESEARCH PERFECTS IT.

And then in the great Fort Wayne plant itself, ideally located for "on-the-doorstep" service to the automotive industry, skilled men pro-

duce the rubber-to-metal parts and precision molded rubber and plastic parts, and precision extrusions that make equipment last longer, ride more comfortably, more economically.

"U.S." sales engineers are right on your doorstep—2nd New Center Bldg., 7430 Second Ave., Detroit 2. They are your contact with the Fort Wayne laboratory and plant. And remember, the "U.S." experts have solved many and many a problem when all others had given



"U.S." Research perfects it up. For full information, write to address below. "U.S." Production builds it

UNITED STATES RUBBER COMPANY

Automotive Sales, Mechanical Goods Division, New Center Bldg., Detroit 2, Michigan

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to December 24, 1952, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which were published in the January 15 issue, page 76, of **AUTOMOTIVE INDUSTRIES**, the following additional certificates were announced by the Defense Production

Administration, December 24, 1952, to March 4, 1953.

Included in this latest tabulation, 15,883 new or expanded defense facilities of all types have been authorized for rapid tax write-off, the total amount eligible for amortization being \$25,266,864,000. These figures are exclusive of cases that are up for later review but included in this list

—in these cases no dollar amount is listed. The figure appearing in parentheses is the percentage authorized for actual fast tax write-off.

— A —

Aeroquip Corporation, Jackson, Mich.
Aircraft parts—\$81,699 (70)
Alfab Manufacturing Co., Miami, Fla.
Aircraft parts—\$31,315 (70)
Alloy Spot Welders, Los Angeles, Calif.
Machining of aircraft and electronic parts—\$30,248 (70)
American Aircraft Mfg. Co., Orange, N. J.
Components of military end items—\$57,048 (70)
Arma Corp., Brooklyn, N. Y.
Aircraft and ordnance parts—\$19,226 (65)
Arma Corp., Garden City, N. Y.
Ordnance—\$18,888 (65)

— B —

B. G. Instrument Corp., Corona, N. Y.
Aircraft parts—\$4,524 (70)
Baldwin-Lima-Hamilton Corp., Burnham, Pa.
Forgings and castings—\$466,075 (65)
Bell Aircraft Corp., Wheatfield, N. Y.
Aircraft & parts—\$41,135 (65)
Aircraft & parts—\$110,000 (60)
Bell Aircraft Corp., Fort Worth, Tex.
Aircraft & parts—\$175,000 (60)
Aircraft & parts—\$53,272 (65)
Aircraft & parts—\$66,000 (60)
Aircraft & parts—\$17,000 (60)
Bendix Aviation Corp., Hamilton, Ohio
Aircraft parts—\$20,347 (50)
Boeing Airplane Co., Wichita, Kans.
Aircraft & aircraft parts—\$48,616 (65)
Bowden Mfg. Corp., Cleveland, Ohio
Aircraft parts—\$9,585 (70)

— C —

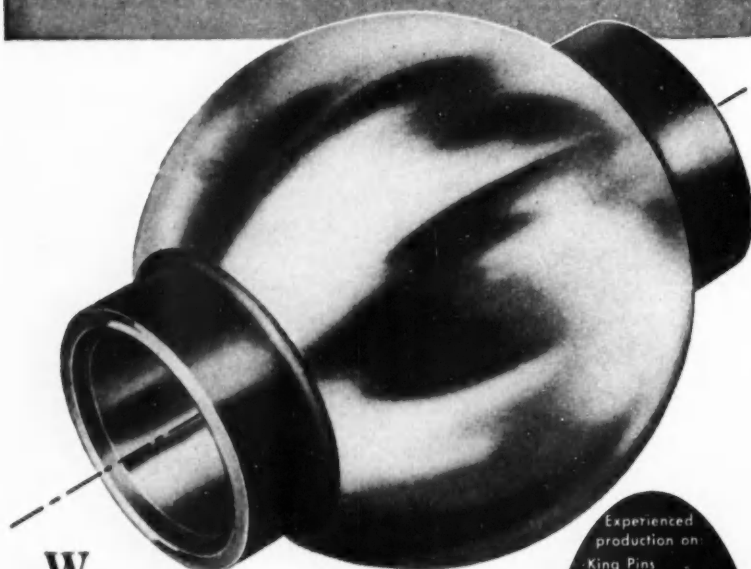
Champion Spark Plug Co., Cambridge, Ohio
Components for military type spark plugs—\$2,389,420 (55)
Chicago Rivet & Machine Co., Bellwood, Ill.
Ordnance—\$110,588 (65)
Congoleum-Nairn, Inc., Kearny, N. J.
Aircraft parts—\$40,086 (65)
Curtiss-Wright Corp., Wood-Ridge, N. J.
Aircraft engines—\$784,381 (60)

— E —

Eaton Manufacturing Co., Cleveland, Ohio
Parts for military type vehicles—\$5,492,100 (65)
Eaton Manufacturing Co., Marion, Ohio
Parts for military type vehicles—\$4,439,300 (65)

(Turn to page 138, please)

Specialized Production of HARDENED & GROUND PARTS



When you've served the automotive industry for more than 40 years as we have done, you become quite adept at machining difficult pieces like the Beam Ball shown here.

Ball O.D. is ground to $3.375 \pm .001$; Bore, to $1.375 \pm .001$. Circular contour is absolutely concentric with bore centerline. Scientifically controlled heat treating provides exceptional surface hardness and consistent strength throughout. The specified finish is Parco Lubrite, as used on many of our products.

This is a sample of the metallurgical engineering, precision grinding and uniform quality that can be readily applied to mass production of your turned, hardened and ground parts. Let us quote on your requirements. Write or wire today.

Henry W. Brown
PRESIDENT

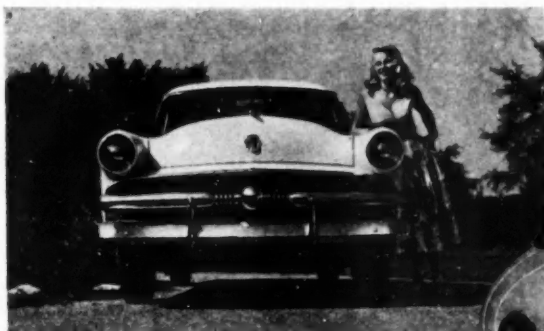
THE BROWN CORP.

215 BELLEVUE AVE.

SYRACUSE, N. Y.

C. H. Ebert, 2017 Cleveland Rd., Cleveland • H. F. Spring, 6716 Ballou Rd., Dayton • R. G. Sanderson, 2805 N. Clark St., Chicago • Harry J. Workmaster, 1700 Carlton, Fort Worth • James W. Wright & Co., 7400 N. Spring St., Los Angeles, Calif. • John B. Hunt, 2011 E.E. Venable St., Portland, Ore.

Experienced production on:
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
... anything in the hardened and ground line, of any analysis steel, up to 4"



Easily fabricated and good for years and years of gleaming, rust-free service, stainless steel fixtures and decorative trim add lasting beauty to both the inside and the outside of today's most luxurious automobiles.

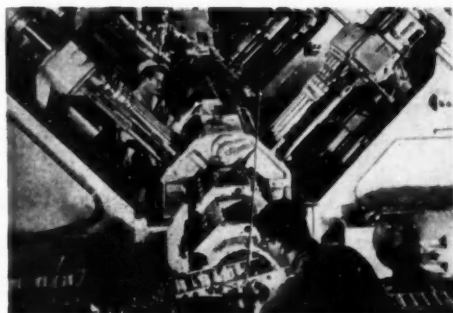


Strong, light stainless steel bodies increase payload capacity, cut cleaning and maintenance costs for trucks of all types. They indicate the almost unlimited possibilities of stainless steels in constructional applications.



Why design
and product engineers say...

MAKE IT STAINLESS



Heat and corrosion resistant stainless steels are used for exhaust valves, water-pump shafts, heat-control manifolds, carburetor float needles and other operating parts in both automobile and truck engines.

More and more frequently, automotive engineers and manufacturers today are saying, "make it stainless."

Virtually indestructible by corrosive action, stainless steels defy the effects of air, water, fumes and chemicals. They can be machined, formed and fabricated; their surfaces can be polished satin-smooth or mirror-bright. Grades of stainless are available to meet a wide range of mechanical and heat-resistant requirements.

Stainless steels are cutting production costs, improving product performance and appearance, increasing customer acceptance in every one of the automotive industries. For complete information, contact your supplier.

The finest stainless steels are made with Vancoram ferro chromium, ferrochrome-silicon and ferro titanium.

VANADIUM CORPORATION OF AMERICA

420 Lexington Avenue, New York 17, N. Y.

CHICAGO • DETROIT • CLEVELAND • PITTSBURGH

Producers of alloys,



metals and chemicals

Here's
METAL EDGE Packaging
AT WORK in 2 typical
Industries!

**UNTANGLING
A CABLE SALES
PROBLEM!**

This sturdy M.E. box has a double value in the highly competitive auto after-market. Specially-designed dispensing slot eliminates cable waste due to tangling ... fresh, clean appearance (thanks to Celolustre finish) impresses dealers with brand name.



**STREAMLINING
WELDING ROD SALES!**

This M.E. Box replaced a bulky, 50-pound welding rod package, made retailing in small quantities more efficient. Special dispenser construction allows rods to be removed individually by the welder, while remainder are protected.

Metal Edge—the engineered method—designs packaging to solve specific problems for the leaders in over 100 American industries.

NATIONAL METAL EDGE BOX CO.

PACKAGING • MATERIALS HANDLING • INVENTORY CONTROL

1208 Callowhill Street, Philadelphia 23, Pa.



(Continued from page 136)

Charles Ebgehard, Inc., East Newark, N. J.

Aircraft parts—\$52,527 (70)

Electric Auto-Lite Co., Fostoria, Ohio

Military type spark plugs—\$1,141,500 (55)

Emsco Manufacturing Co., Los Angeles, Calif.

Aircraft parts—\$12,614 (65)

Ex-Cell-O Corporation, Highland Park, Mich.

Aircraft parts—\$43,400 (65)

— F —

Fairchild Engine & Airplane Corp., Bay Shore, L. I., N. Y.

Aircraft parts—\$93,360 (65)

Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

Aircraft parts—\$5,599 (65)

Fairchild Engine & Airplane Corp., Wyandanch, L. I., N. Y.

Ordnance—\$35,000 (65)

Farm Tools, Inc., Cleveland, Ohio

Aircraft parts—\$21,290 (70)

Flour City Ornamental Iron Co., Hennepin County, Minn.

Aircraft parts—\$101,328 (65)

— G —

G & M Machine Co., Inc., Los Angeles, Calif.

Aircraft parts—\$88,304 (70)

General Motors Corp., Saginaw, Mich.

Steel castings—\$220,364 (65)

Gibson Refrigerator Co., Greenville, Mich.

Ordnance—\$20,513 (65)

— H —

Hetherington, Inc., Sharon Hill, Pa.

Aircraft parts—\$15,222 (70)

Holt Products Company, Holt, Mich.

Ordnance—\$35,000 (70)

Hydraulic Research & Manufacturing Co., Burbank, Calif.

Aircraft parts—\$22,889 (70)

Hydro-Aire, Inc., Los Angeles County, Calif.

Aircraft accessories—\$113,787 (70)

— K —

Kiekhaefer Aeromarine Motors, Inc., Oshkosh, Wis.

Aircraft components—\$95,130 (40)

— L —

Lockheed Aircraft Corp., Burbank, Calif.

Aircraft parts—\$90,861 (65)

Aircraft & aircraft parts—\$74,863 (60)

Aircraft parts—\$37,098 (60)

— M —

McLean Development Laboratories, Inc., Dallas, Tex.

Aircraft parts—\$21,226 (70)

(Turn to page 140, please)

1440

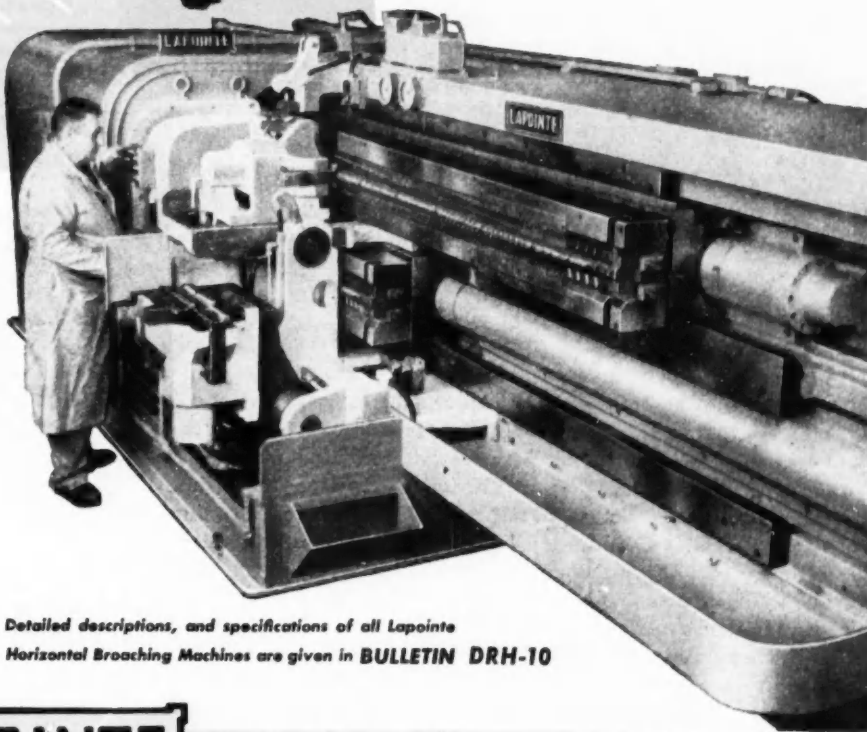
per hour
is the production rate in **BROACHING**
these **MAIN BEARING CAPS**

This high production is
accomplished on the

LAPOINTE

Double Ram Horizontal
Broaching Machine, 15-ton size,
with 90-inch stroke
... using Carbide Broaches.

Operating at 80 fpm
cutting speed, these Main
Bearing Caps are
broached in clusters of 5,
with the half-round,
joint faces, and chamfered
edges all broached
in one operation!



SEND FOR FOLDER. Detailed descriptions, and specifications of all Lapointe
Horizontal Broaching Machines are given in **BULLETIN DRH-10**

THE **LAPOINTE**

MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

HUDSON
LAPOINTE
MASS.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

(Continued from page 138)

M. C. Manufacturing Co., Lake Orion, Mich.

Aircraft components—\$48,145 (70)

Magnus Tool & Die Co., Newark, N. J.

Aircraft parts—\$3,643 (70)

Man-Sew Corp., New York, N. Y.

Aircraft parts—\$11,243 (70)

Marquette Metal Prod. Co., Cleveland, Ohio

Aircraft parts—\$25,152 (65)

Mars Engineering & Mfg. Co., Burbank, Calif.

Aircraft parts—\$175,716 (65)

Aircraft parts—\$101,263 (65)

Martin Aircraft Tool Co., South Gate, Calif.

Aircraft tools—\$1,726 (70)

Modglin Co., Inc., Los Angeles, Calif.

Aircraft parts—\$85,000 (45)

The Murray Ohio Mfg. Co., Cleveland, Ohio

Ordnance—\$66,175 (65)

— N —

Narmco Manufacturing Co., La Mesa, Calif.

Aircraft parts—\$35,500 (45)

Neuschotz Engineering Co., Los Angeles, Calif.

Aircraft parts—\$23,004 (70)

New York Air Brake Co., Watertown, N. Y.

Aircraft components—\$277,605 (60)

— O —

The Oliver Corp., Battle Creek, Mich.

Ordnance—\$96,508 (60)

John Oster Mfg. Company, Racine, Wis.

Aircraft parts—\$164,474 (65)

— P —

Perflex Corporation, Milwaukee, Wis.

Aircraft parts—\$4,556 (70)

Plane Parts, Inc., New Haven, Conn.

Aircraft parts—\$24,390 (70)

— R —

The Randall Co., New Vienna, Ohio

Ordnance—\$12,508 (55)

Ravenna Metal Products Corp., Seattle, Wash.

Aircraft & Ordnance—\$24,721 (70)

Ronson Art Metal Works, Inc., Newark, N. J.

Aircraft parts—\$4,205 (65)

Rudy Manufacturing Co., Dowagiac, Mich.

Ordnance—\$57,700 (70)

— S —

Shakespeare Co., Kalamazoo, Mich.

Aircraft parts—\$10,234 (70)

Starr Engineering Co., North Hollywood, Calif.

Aircraft parts—\$107,306 (70)

Swann Tool & Machine Co., Hartford, Conn.

Aircraft parts—\$11,157 (70)

— T —

Tapered Air Products, Los Angeles, Calif.

Aircraft parts—\$42,000 (70)

— U —

United Aircraft Corp., East Hartford, Conn.

Aircraft engines and parts—\$5,247,000 (65)

— W —

Weba, Inc., New York, N. Y.

Aircraft parts—\$14,346 (70)

Western Supplies Co., St. Louis, Mo.

Ordnance and aircraft parts—\$22,074 (65)

Westholt Mfg. Co., Wichita, Kans.

Aircraft parts—\$53,647 (70)

● In Flexon Thermostats the engine manufacturer gets a combination that is vital to his operation—a quality product backed by a reputable manufacturer with over 50 years manufacturing experience. Since 1902, Flexonics Corporation has specialized in the manufacture of products that utilize flexible metal elements. Since 1937, Flexonics Corporation has manufactured quality bellows. All the know-how accumulated over these years goes into every Flexon Thermostat. All the experience in meeting customers' specifications and production schedules has developed a policy of complete cooperation to help keep your output flowing smoothly.

We would like to have the opportunity to go over your needs with you and show you what Flexonics Corporation can do for you. Write, wire or phone to have your Flexonics sales engineer call.

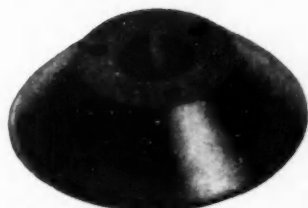
Flexonics Corporation FLEXON BELLOWS DIVISION
1396 S. THIRD AVENUE • MAYWOOD, ILLINOIS
FORMERLY CHICAGO METAL HOSE CORPORATION

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

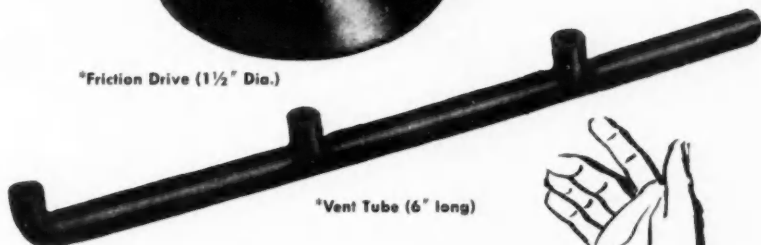
Flexon identifies CMA products that have served industry for over 50 years.

The PARKER Rubber Engineer can help you with

Custom Molded Rubber Parts



"Friction Drive (1½" Dia.)



"Vent Tube (6" long)

like
these:

***FRICTION DRIVE**—Must withstand hard wear. Parts furnished to customer by previous sources were unsatisfactory in appearance and service. PARKER compound and precision molding solved the problem.

***VENT TUBE**—Used in a battery. New PARKER process makes possible accurate molding of this difficult part. PARKER compound gives unusually long life under rugged conditions.

- for extreme temperature and atmospheric conditions
- for service with special fuels and lubricants
- for service with acids or gases
- and to meet exacting tolerance specifications

If your molded rubber parts must meet really rough resistance requirements and yet provide a long, trouble-free life, it will pay you to discuss your problem with the PARKER Rubber Engineer. PARKER can formulate a compound that will solve your specific problem and mold it to your specifications, in nearly any shape, particularly in smaller sizes, and to exacting dimensional tolerances.

PARKER—leading manufacturer of synthetic rubber O-rings—has had years of experience in developing special-purpose rubber parts for the automotive, electrical appliance and other industries. So, if you need custom molded rubber parts for tough service conditions, mail the coupon today.



EXCLUSIVE NEW TECHNIQUES—PARKER offers newly perfected, low-cost, high-production processes and molding methods which make possible greater values in superior custom molded rubber parts. Investigate this PARKER service today!

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The PARKER Appliance Company
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- ☐ Please send information on Custom Molded Rubber Parts.
☐ Please have PARKER Rubber Engineer call on me.

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COMPANY _____
ADDRESS _____
CITY _____ STATE _____

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THE PARKER APPLIANCE COMPANY
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IF YOU HAVE a production joining problem, bank on resistance welding and use the facilities of Taylor-Winfield. We have sales and application engineers who spend their time on specific customer projects.

If you will outline your needs, we will give you some practical help. T-W specializes in shirt-sleeve assistance on resistance welding. We design, engineer and build resistance welders into your production line. For prompt attention, address your inquiry to the nearest sales office.

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WASHINGTON • STAMFORD
DUNDAS, ONTARIO

Resistance Welders Since 1898

THE TAYLOR-WINFIELD CORPORATION • WARREN, OHIO



News of the MACHINERY INDUSTRIES

(Continued from page 134)

decline in cancellations, which in February dropped to 10 per cent of gross orders received, the lowest ratio in more than a year. However, there is some concern in the industry because military production orders still are not high enough to utilize the greatly increased production capacity, which is the highest in history. The National Machine Tool Builders Association reports that its present backlog of orders stands at nine months capacity, a reduction from the 9.4 months in January.

Machine Tool Prices Adjusted to Costs

There has been no general across-the-board price increases on machine tools since price controls have been removed. However, there have been adjustments and more are expected on individual items which have been in a bad profit position under controls, but the increases are not expected to be substantial. Prices of some machinery, of course, will not be changed at all if its cost relationship is reasonable. Increases in cost of labor or by suppliers, however, could force an upward price movement.

Defense Dept. O.K.'s AF Defense Program

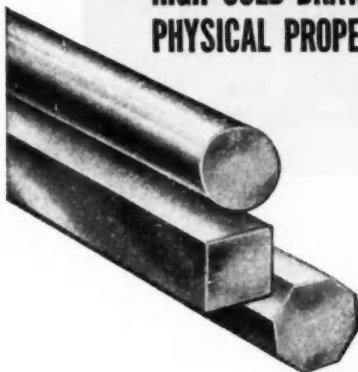
Apparently the Air Force program calling for expenditure of about \$396 million over the next two years for construction of huge forging and extrusion presses is safe, at least for the time being. The Defense Dept. has reviewed the program and has approved going ahead with construction of 16 heavy presses which will have capacities of from 16,000 to 50,000 tons. The program has been under fire from civilian officials in the Defense Dept. as being experimental and much too costly to carry out in the original concept.

Brill Making Starter

ACF-Brill Motors Co. has started delivery on an \$8.5 million Air Force contract for the production of mobile starters for jet and regular airplane engines. The starter, a wheeled vehicle carrying an electric generator powered by a gasoline engine, can also be used for other auxiliary power purposes. The firm also has received a \$4.9 million contract for production of camera pods for B-47 bombers.

*Take the
inside track
to better
products*

If you need
COLD FINISHED STEEL
that has
GOOD MACHINABILITY
**GOOD HEAT-TREATING
PROPERTIES**
**HIGH COLD-DRAWN
PHYSICAL PROPERTIES**



J & L JALCASE

is a sure bet

It's produced by J&L, the *originator* of these grades.

It's available in grades suited to a wide range of applications.

It's supplied as cold-drawn or cold-drawn with metallurgical processing which includes special tempering.

Its typical analyses are found in the AISI 1100 series.

It's backed by J&L steel-making know-how that can help you apply it to your particular applications.

Set the wheels in motion towards determining how you can produce better parts, faster, with Jalcase, the original open hearth free-machining steel. Fill in the coupon to get detailed descriptive information on J&L Jalcase . . . or, better still, contact the J&L representative nearest you today.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH

Jones & Laughlin Steel Corporation
430 Gateway Center, Pittsburgh, Pa.

- ☐ Please send me a free copy of your booklet.
"You can make them better with J&L Jalcase."
☐ Please have your representative call.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

**J&L
STEEL**



How Special Machinery is Developed

(Continued from page 53)

the major purpose of trying to discover flaws in the design.

The Design Conference

This conference must be handled by a skilled leader in order to be sure that all the basic faults of the design are brought out. This procedure may

sound a little harsh on special machine designers, particularly the sensitive type, but a good conference leader can sell the designer on the long term advantages of modifying or possibly starting anew at this stage rather than having to dispose of a physical machine or parts at a later date.

The design conference also provides an excellent opportunity to get production supervision well acquainted with the proposed equipment. Having had a part in the actual design, supervision will realize that the equipment is being built for them and is not being forced on them. Selling down the line is as important as selling to management.

During all the design stages, the Project Engineer, who has made all the cost estimates to date, keeps re-checking his figures and, when the estimates are as complete and accurate as possible, a project report is made. This report covers the present and proposed methods, estimated cost of new equipment, estimated savings, and investment return. Requests are then made for appropriation approval, in order to start actual machine construction.

After the project has been approved and the machine is under construction, the machine building shop and designer must work closely together to be sure that the drawings are like the machines. The shop is given a free hand to make whatever changes are necessary in order to produce a successful operating machine, and the drawings are corrected to show such changes.

Making the Machine Work

Making the machine work requires the highest order of ingenuity and patience. Fully 20 per cent of the cost of the machine will be expended during this period. Special machines are not built by pessimists and they seldom justify the optimism of their builders when first tried out. Two dangers exist at this stage—the first is the tendency to make radical changes in the machine, and the second is an unwillingness to make changes that are actually necessary. Experience and sound judgment are the only guides. To one who is not in close daily contact with the machine, it would seem that the machine builder does not know what he is doing. Today he knows just what is wrong and tomorrow it is something different. He is always apparently just on the verge of getting it into operation. When "bugging" a complicated special machine this may extend over a considerable period, but it is truly remarkable how seldom a skilled development organization will have a complete failure.

When the machine begins to perform with reasonable success it is time to place operators on it and at-



**LOWER THE
BOOM ON COSTS
SET RIVETS
FAST**
2 at a time with the
Chicago
"214"

● With every press on foot pedal Model 214 Chicago Double Rivet Setter automatically feeds, inserts and clinches two rivets. 14-inch throat accommodates large assemblies. Handles 9/64" diameter or smaller steel tubular rivets—lengths to 7/8". Quick Change Rotary Type Hoppers and Raceway permit 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to versatility. For help with fastening problem . . . send sample assembly (or a blue print) for free fastening analysis.

FREE CATALOG contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.



Chicago Rivet & MACHINE CO.
9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
Branch Factory: Tyrone, Pa.

moraine- **400**

*...the bearing that
helps new engine designs
come true*



Because they remove bearing length as a limiting factor in engine design, Moraine-400 bearings help to make more compact engines of higher horsepower possible.

For example . . . one of our customers is now developing an engine that will have impressively greater output without greater bulk. Its features include a stiffer crank-

shaft, larger pistons, more rigid connecting rods . . . and, because Moraine-400s are being used . . . *narrower bearings!* In addition, tests indicate that bearing life will be increased as much as 400 per cent!

May we suggest that your engineers consider Moraine-400 bearings in designing and developing your engines of the future.



**moraine
products**

DIVISION OF GENERAL MOTORS CORPORATION • DAYTON, OHIO

PAINT FINISH BAKING THAT GIVES

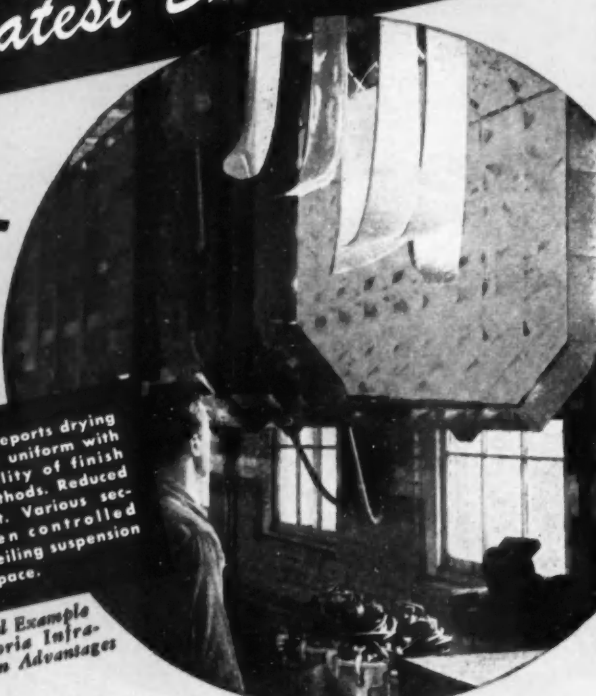
*Finest Appearance
Greatest Durability*

PLUS

**FASTEST
PRODUCTION
LOWEST
"PER PIECE"
COST**

Casco Products reports drying accelerated and uniform with improved quality of finish over other methods. Reduced operating cost. Various sections of oven controlled separately. Ceiling suspension saves floor space.

*A Typical Example
of Fostoria Infra-
red Oven Advantages*



SUPERB QUALITY

SMOOTH "FLOW-OUT" OF PAINT
Uniformity of heat distribution and rapidity of solvent removal give smooth, even paint film.

THOROUGH UNIFORM BAKE
Near Infra-red energy penetrates paint film with constant uniform temperature.

CLEAN FINISH
No by-product of combustion—no condensation of solvent volatiles to mar finish.

SAFETY CONTROLLED
Instant heat shut-off with conveyor stoppage. No over-baking by shut-off lag.

Write—for brochure of technical facts. Tell us about your particular problem and we will include case history data directly applicable to your operations.

HIGHEST EFFICIENCY

LOWEST OPERATING COST
Puts heat into the product—not into oven walls. Uses less fuel. Gold plated interior reduces heat loss to 2%.

REQUIRES LESS FLOOR SPACE
Shorter Cycles—most production for oven size. May be ceiling mounted.

FASTEST PRODUCTION
Fastest means of heat transfer. No warm-up required—no shut-off lag. Heat levels instantly changeable.

LOWEST MAINTENANCE COST
Clean operation—no combustion by-products. Lowest source replacement cost.

COMFORTABLE WORKING CONDITIONS
No room ventilation problem.

COMPETITIVE INITIAL COST
Comparable to any quality-built oven.

tempt production runs. Control of the machine should be taken from the builder and placed in the hands of the operator trainer. The viewpoint of these two individuals is entirely different. The mechanic is in the business of building machines and it is hard for him to finish a machine he has worked on for, perhaps, months. On the other hand, the operator trainer is only interested in the machine as a means of producing so many parts per hour. He wants to run it as long as it will produce, and resents any shutdown. Some of the failures of the machine to achieve perfection, which would annoy the builder, are of minor importance to him.

The Trainer's Job

The trainer's job is to understand people and their movements as well as the machine builder understands the machine and its movements. Production supervision and time study work closely with the trainer, so that the job may be moved into production and produce at an agreed rate when it is ready. A good operator trainer gets a new machine into the production line in the shortest possible time. In a special machine building organization he is invaluable.

Within a reasonable time after the machine is in production, its performance record is checked to see if the original estimates have been made. This should be as complete in detail as the original cost estimate to which it is compared. Any variations from expected performance should be studied and recorded for use on future designs.

The advent and progress of materials such as tungsten carbide, and alloy steels, improved bearings, hydraulics, electronics, etc., have made it almost impossible for one man to keep abreast of all the fields—hence, the formation of the development organization, where specialists in their respective fields can be called upon to assist in proper designing on special equipment. The more complete the knowledge of modern arts and facilities embodied in this group, the greater the assurance that the special machine will be the best for the job. Over the years, Delco-Remy Division has built up such an organization which now designs and builds special machines complete.

**AUTOMOTIVE INDUSTRIES
Keeps You Informed**

THE FOSTORIA PRESSED STEEL CORP.
FOSTORIA, OHIO, Dept. I

Please send me information on Infra-red Ovens for

Name

Company

Street

City State

**INFRA-RED
fostoria
OVENS**

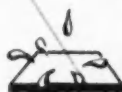
TEFLON is

a trademark of E. I. DuPont Co. for polytetrafluoroethylene. It is supplied by C-D-F in tapes and sheets, both plain and fibre glass cloth supported.



HEAT RESISTANT

Teflon may be used continuously at 200°C. (392°F.); or for short periods at 250°C. (482°F.). Meets A.I.E.E. Standards for Class H electrical insulation.



MOISTURE RESISTANT

Teflon products have practically zero water absorption and are unaffected by fungus, humidity and temperature changes. It remains pliable at -87.5°C. (-100°F.).



ARC RESISTANT

Teflon will not carbonize, but rather will vaporize. When the arc is extinguished, full insulation is restored.



CHEMICAL RESISTANT

Teflon is the most inert of all commercial thermoplastics and is not affected by any known solvent.

THAT'S WHY C-D-F TEFLON TAPES AND SHEETS CAN OFFER THESE BIG ADVANTAGES



FOR LINING SLOTS C-D-F sheets of fibre glass cloth supported Teflon can be cold-formed into easily loaded slot liners. Teflon is naturally slippery smooth, with plenty of "snap back." High in dielectric strength, liners are rated Class H insulation.



FOR WRAPPING CABLES C-D-F Teflon tapes are tough, strong, and stretchable. Teflon can be supplied unsupported, or combined with fibre glass fabrics in a variety of widths and thicknesses. It is suitable for winding around sharp bends or odd shapes.



FOR CHEMICAL AND MECHANICAL USES Remember, Teflon is non-adhesive and chemically inert. Bakers, food packagers, and pump manufacturers use it. For applications requiring extreme electrical insulation stability, high temperature or resistance to corrosion, C-D-F unsupported and fibre glass cloth supported products can do a job for you.

C-D-F's work with Teflon is really rolling! New applications are being developed daily in our laboratories by specialists who are devoting their entire time to improving and developing new Teflon products. Start talking Teflon with the man from C-D-F (sales offices in principal cities)—he's a good man to know!



Continental-Diamond Fibre Company
NEWARK 2, DELAWARE

Got A Hard-To-Reach Place



**use
MIDLAND
Welding Nuts**

Midland Welding Nuts anchored* to parts in inaccessible places eliminate the need for holding them while attaching other parts.

***THIS IS ALL YOU DO**—Just insert collar of Midland Welding Nut in hole for bolt or screw, resistance weld the Nut in place, and the Nut is there for the life of the job. Nuts can be automatically fed to the welder. Speed your production . . . save money.



The MIDLAND STEEL PRODUCTS COMPANY

6660 Mt. Elliott Ave. • Detroit 11, Michigan
Export Department: 38 Pearl St., New York, N. Y.

Manufacturers of

AUTOMOBILE AND
TRUCK FRAMES

AIR AND VACUUM
POWER BRAKES

AIR AND ELECTRO-PNEUMATIC
DOOR CONTROLS

**The
BUSINESS
PULSE**

(Continued from page 70)

very sharp recent rise which has occurred in the awarding of heavy construction contracts. Such awards amounted to \$3.8 billion during the first 12 weeks of 1953, according to *Engineering News-Record*, an all-time high for the period, 37 per cent greater than in the corresponding weeks of 1952.

With production activity running at such phenomenally high levels, increasing attention is being paid to the volume of consumption, with a view to determining whether or not it is currently adequate. Unfortunately, this is an area where present methods of analysis leave a great deal to be desired, and differences of opinion with regard to the present output-consumption pattern are consequently numerous. Some general observations are possible from a study of available data, but they are at best rough approximations of the truth and lack conclusiveness.

Increase in Retail Sales

Recent experience in retail sales—one of the most important components of the consumption total—is fairly encouraging. Total sales, both dollar-wise and in physical volume, have recently been running substantially above the levels of a year ago and also above those typical of 1951. Particularly important in the last several months has been the sharp increase in durable-goods sales occasioned by a gain in purchases of automobiles, a development which appears to have been greatly facilitated by the use of consumer credit. Whether the rise in sales has been proportionate to the increase in production is a difficult matter to resolve, one complicated by the fact that industrial production supplies a variety of end uses besides consumption at the retail level. There was a fairly substantial increase in the physical volume of business inventories in the final quarter of 1952, but this was at least partly attributable to a voluntary rebuilding of strike-depleted stocks in durable manufacturing. During January there was an actual decline in the book value of total business inventories on a seasonally adjusted basis, affording at least temporary reassurance to those observers who had felt concern over the rise that occurred in the final months of the year. In most cases, sales have

L. A. YOUNG
design and
production
engineering helps



**SIMPLIFY
OR
SOLVE**

even the most
difficult problems

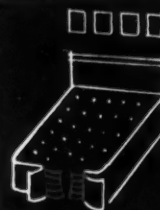
L. A. YOUNG SPRING & WIRE CORPORATION

GENERAL OFFICES • DETROIT 11, MICHIGAN

IN CANADA: L. A. YOUNG INDUSTRIES, LTD., WINDSOR, ONTARIO



Supplier of Brake, Clutch, Valve, and Mechanical Springs to the Automotive and Other Industries.



Supplier of Inner Coil Spring Units to Mattress and Furniture Manufacturers.



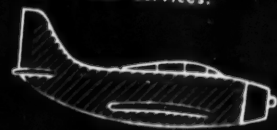
Supplier of Racks and Shelves to the Refrigerator and Stove Manufacturers.



Supplier of Interior Metal Trims and Spring Seating Units to the Automotive Industry.



Supplier of "Star Service" All Wire and "Paper-Strut" Garment Hangers to Cleaners and Dyers.



Supplier of Fuselages and Ammunition Components to the Armed Services.

VITAL NEWS FOR USERS OF OLD SCREW MACHINES

Lipe Automatic Magazine- Loading Bar Feeds boost output 30% and more on 15 to 30-year old B&S's!

Lipe's AML Bar Feed greatly speeds-up stock feeding. Enables a screw machine to produce 90% or more of its gross geared production capacity. Increases output at least 30%—in many instances better than 100%!

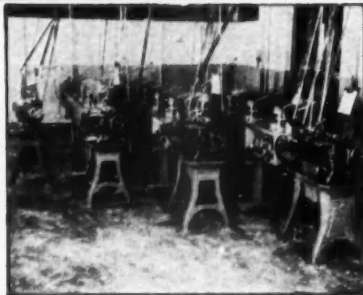
Makes feed fingers obsolete

Lipe's AML Bar Feed is actuated by a pneumatic control system of valves and cylinders. Stock is fed through the collet by a pusher rod at the end of the bar. There is no other point of contact. This method of feeding does away with feed fingers . . . abolishes multiple feed finger feedouts . . . eliminates scratching and marring of high-finish stock . . . reduces scrap and rejects.

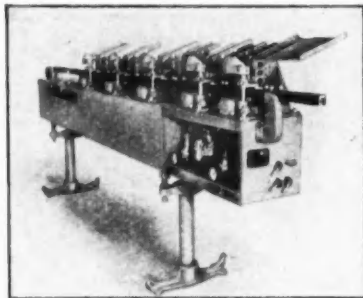
Load it . . . forget it

Magazine holds a normal 8-hour day run of stock. Capacity ranges from 19— $\frac{3}{8}$ " to 96— $\frac{1}{8}$ " bars. Loading and feeding are automatic. Stock is fed continuously . . . there's no idle operation—no "cutting air." Operators are relieved of repetitious stock bar handling . . . can attend a greater number of machines.

Convert your old screw machines into modern, high-production equipment . . . economically! Let our engineers show you how. No obligation. Write
Lipe-Rollway Corporation, Syracuse 1, N.Y.



This battery of 25-year old screw machines received a production "shot in the arm" when equipped with Lipe AML Bar Feeds.



Lipe AML Bar Feeds help overcome new equipment shortages . . . cut cycle time, increase actual gross of older machines.

MODEL AML BAR FEEDS AVAILABLE FOR . . .

B&S No. 00 Spindle Bore $\frac{3}{16}$ "

B&S No. 00 Spindle Bore $\frac{1}{16}$ "

B&S No. 0 Spindle Bore $\frac{3}{8}$ "

B&S No. 0 Spindle Bore 1"

Other Lipe Pneumatic Bar Feeds available for other screw machines, automatic or hand, handling from $\frac{1}{8}$ " to 2 $\frac{1}{2}$ " diameters.

increased enough to raise the current ratio of sales to inventories to a level at least as high or higher than in late 1951 and early 1952, and unless there is a marked resumption of the previous inventory accumulation, alarmist sentiments would appear unfounded. Of course, it must be remembered that inventories are currently fairly high in absolute terms, and if sales were to decline abruptly as a result of a change in consumer psychology, the inventory level might well prove burdensome. For the time being, however, inventories do not appear to be radically out of line with sales by historical standards.

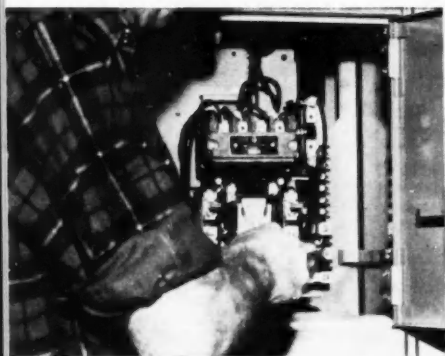
Future Consumer Spending

With regard to the future pattern of consumer spending, there is ground for optimism in results of a recent survey of consumer finances and intentions conducted by the Research Center of the University of Michigan for the Federal Reserve Board. According to the Reserve Board, "the general conclusion to be drawn from the 1953 survey (conducted in January and February) is that consumers have a confident attitude concerning their financial position and expect to purchase automobiles and major household durable goods in large volume this year. They also plan to purchase new and existing houses in substantial volume." In elaborating on these plans, the Board observes that "increases in income in 1952 were widely distributed and, with consumer prices relatively stable, the proportion of consumers who feel their financial situations have improved is somewhat larger than in any previous postwar survey." This is the eighth such survey conducted by the Research Center. While previous surveys have been remarkably accurate, it is well to remember that consumer intentions are subject to quick and sharp revision, and there is no certainty that the intentions indicated by this latest sample study will be translated into market purchases. However, it has provided encouragement, and in conjunction with a recent Department of Commerce survey showing an upward revision since last fall in planned investment expenditure by business for 1953, it has definitely tended to strengthen business confidence. A rise in consumer and business expenditures might prove especially important during the latter part of the year, if Secretary of Defense Charles E. Wilson succeeds in holding defense outlay at or even below present rates, as is his hope.

ENGINEERED FOR YOU,
the new G-E motor control center is the result of intensive field surveys which told us what industry wants most. It provides maximum flexibility (units easily interchangeable) for central control of a-c motors up to 200 horsepower.



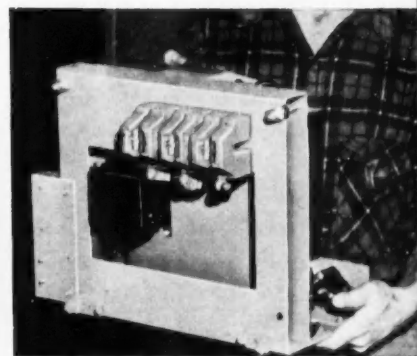
Here are Six Reasons for Specifying the New G-E Motor Control Center



1 FOUR-INCH TROUGH for incoming power lines; terminals in front for easy wiring, maximum accessibility.



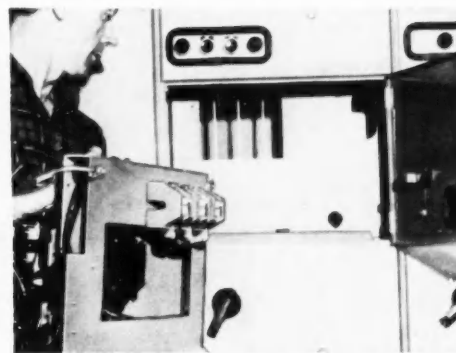
2 UNITS EASY TO CHANGE. To remove, disconnect terminals, pull unit out. Units easily changed since all components are on unit frame.



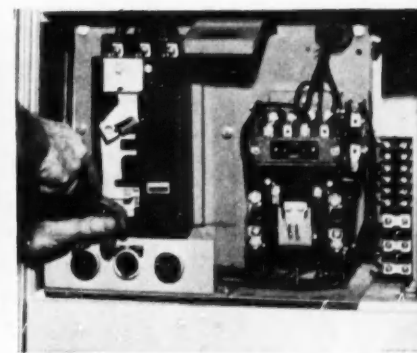
3 LIGHTWEIGHT UNITS are compact and easy to handle. This Size 1 starter unit weighs only 30 pounds.



4 ACCESSIBLE WIRING. Contactors, relays, pushbuttons, and breaker are easily accessible from all four sides.



5 BUS PROTECTED. Steel barrier keeps personnel away from bus. For added safety, compartment doors can be closed while unit is out of compartment.



6 DISCONNECT POSITION cuts unit power off; bus connections made automatically in operating position.

FOR FURTHER INFORMATION, contact your nearest G-E Apparatus Sales Office or authorized G-E distributor, or write Section 781-2 for Bulletin GEA-4979A today. General Electric Company, Schenectady, New York.

You can put your confidence in—

GENERAL  ELECTRIC

Cincinnati
CLEANING MACHINE

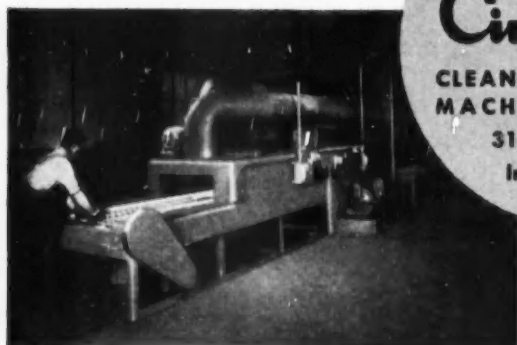
"Tremendous Time and Labor Saver..."

FOR MIDWESTERN
MANUFACTURER.....

time saved ... **75%**
labor saved ... **81%**
results ... much better

Cleaning steel channel and moulding, this firm formerly used methods requiring the full time of four workers every day. Cincinnati engineers studied the cleaning problem, and adapted a Cincinnati wash, rinse, and dry belt-conveyor washing machine to the job. With this machine, results are "much better," and the work is done by only two operators working just three hours per day.

If you have no automatic cleaning equipment, or if you wish to modernize your present equipment to reduce your costs, consult Cincinnati engineers. From long experience, they can show you by case histories closely approximating your needs how a Cincinnati machine or system can improve your cleaning and reduce your costs. Write for latest literature.



Cincinnati
CLEANING & FINISHING
MACHINERY CO., INC.
315 Hecla Street
Ironton, Ohio

More Defense Contract Awards

THIS latest list of defense prime contracts that have been awarded covers the period from February 6, 1953, to March 18, 1953. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, warplanes, automotive components and spare parts, automotive maintenance equipment, etc.

— A —

A. C. Spark Plug Div., General Motors Corp., Flint, Mich.
Spark plug—Various—\$80,170
Adel Division, General Metals, Burbank, Calif.
Parts—Various—\$234,770
Parts—Various—\$30,012
Advance Gear & Mach. Corp., Los Angeles, Calif.
Gear box—28—\$26,100
Aerocraft Metal Products Company, Detroit, Michigan
Vehicle parts—10,000—\$49,500
Airesearch Manufacturing Company, Los Angeles, Calif.
Actuator—24 ea—\$56,647
Airesearch Mfg. Co., Div. of the Garrett Corp., Los Angeles, Calif.
Maintenance parts—Various—\$48,272
Actuator—Various—\$101,649
Alexander-Tagg Industries, Inc., Hatboro, Pa.
Vehicle parts—126,480—\$6,200
American Car & Foundry Company, New York, N. Y.
Final processing, T98E1 and T141 vehicles—\$2,369,259

— B —

Barber-Colman Company, Rockford, Ill.
Thermostat—1630 ea—\$54,198
Barber-Green Co., Aurora, Illinois
Spare parts—Various—\$83,020
Bendix Aviation Corp., Bendix Products Div., S. Bend, Indiana
Carburetor—1084 ea—\$355,991
Stand assy., gas turbine fuel controls—5—\$314,686
The Benson Mfg. Company, Kansas City, Mo.
Fan assy.—144 ea—\$288,382
Bismuke Tire & Rubber Company, Clarksdale, Miss.
Tires—11,050—\$135,548
Borg Warner Corp., Warner Gear Div., Muncie, Indiana
Vehicle parts—45,800—\$10,000
Thompson Bremer, Chicago, Ill.
Hardware—12,900,000—\$60,114
Briggs Stratton Corp., Milwaukee, Wis.
Spare parts—Various—\$43,631
W. D. Bright Enterprises, Waltham, Mass.
Vehicle parts—16,000—\$11,520

— C —

Cadillac Gage Company, Detroit, Mich.
Turret control systems—4 ea—\$8,255
\$25,000

(Turn to page 154, please)



ARO OXYGEN REGULATORS
for Better Performance...
Simplified Servicing!

Precision-made ARO Two-Stage Automatic Continuous-Flow Oxygen Regulators meet *all* aircraft requirements. Widely used . . . ARO-built to provide better performance, simplified servicing.

All models are variants of a basic regulator, Model 10409, and will give specified performance on inlet pressures of 50-200 p.s.i. These models cover all currently known installation requirements. Models can be furnished with output performance

according to Civil Aeronautics or specification Type A-11.

ARO has modern facilities and years of know-how in producing high-precision aircraft products. Adequate facilities for servicing oxygen equipment are as close as your nearest phone. Write or call . . .

THE ARO EQUIPMENT CORPORATION, BRYAN, OHIO
Offices in All Principal Cities



OXYGEN REGULATORS
Air & Oxygen System Accessories
Actuating Cylinders
Vacuum, Fuel & Booster Pumps

"CHICAGO"

precision valve gear parts



- Steel
- Cast Iron
- Steel and Iron

Hydraulic Tappets • Mechanical Tappets • Roller Followers • Push Rods • Self Locking and Standard Thread Adjusting Screws • Valve Spring Retainers • Split Valve Locks • Rocker Arm Shafts •

Connecting Rod Bolts.....Hydraulic Cylinder Pistons
Cylinder Head Studs.....Cylinder Head Cap Screws
Main Bearing Studs.....Main Bearing Cap Screws
Flywheel to Crankshaft Screws.....Diesel Energy Cells
Wheel Bolts and Studs.....Differential Carrier Screws
Oil Pump to Distributor Shafts.....Remote Control Levers
Automatic Transmission Valves.....Water Pump Shafts

Special Screw Machine Parts 1/16" to 5" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products

The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

(Continued from page 152)

Campbell Chain Company, York, Pa.
Hardware—195,726—\$1,821,494
Carlisle Corporation, Carlisle, Pa.
Tires—16,700—\$26,356
Chevrolet Motor Div., General Motors Corp., Detroit, Mich.
Cab assy.—733 ea—\$388,665
733 ea
Automobiles—28 ea—\$39,719
1/2 ton pickup trucks—27 ea—\$33,956
Chrysler Corporation, Detroit, Mich.
Parts and/or assemblies for tank—\$22,536
\$2,464
Deep water fording kits for tank—405—\$307,395
Tank, T48—28—\$4,200,000
Spare parts—1/2 set—\$1,400,000
Cleveland Aero Products, Inc., Cleveland, Ohio
Strut assy.—30 ea—\$79,893
The Cleveland Chain and Manufacturing Co., Cleveland, Ohio
Hardware—40,800—\$763,528
Climax Engine and Pump Company, Clinton, Iowa
Spare parts—Various—\$247,173
The Columbus Auto Parts Company, Columbus, Ohio
Vehicle parts—20,000—\$34,128
Consolidated Vultee Aircraft Corp., San Diego, Calif.
Parts—Various—\$42,229
Consolidated Vultee Aircraft Corp., San Diego, Calif.
Repairs & services—\$75,000
Cooper Tire & Rubber, Findlay, Ohio
Tires—1692—\$50,380
Tires—18,000—\$422,100
Tires—3020—\$50,461
Tires—2250—\$28,417
Tires—25,000—\$231,250

— D —

Dana Corp., Toledo, Ohio
Vehicle parts—20,945—\$50,848
DeLuxe Products Corp., La Porte, Indiana
Spare parts—Various—\$94,631
Denman Rubber, Warren, Ohio
Tires—1924—\$50,591
Tires—1200—\$50,988
Diamond T Motor, Chicago, Ill.
Truck, 5-ton—377 ea—\$5,712,177
5-ton trucks—2209—\$4,121,501
Dorsey Trailers, Inc., Elba, Alabama
Spare parts—Various—\$83,441
Douglas Aircraft Company, El Segundo, Calif.
Maintenance parts—Various—\$318,545
Rack assys—96 ea—\$64,716
Douglas Aircraft Co., El Segundo, Calif.
Maintenance parts—Various—\$53,300
Maintenance parts—Various—\$64,449
Douglas Aircraft Company, Santa Monica, Calif.
Maintenance parts—Various—\$190,719
Strut assy.—30 ea—\$124,575
Strut assy.—17 ea—\$70,593
Piston—23 ea—\$36,008
Repair of wing spar—1 ea—\$40,137

— E —

Eastman Mach. Company, Buffalo, New York
Shafts & actuators—Various—\$146,952
Eaton Manufacturing Company, Detroit, Mich.
Vehicle parts—40,000—\$135,864
(Turn to page 156, please)



PERMITE VALVES

Chosen for their Proven Performance!

LEADING automotive engineers specify Permite Valves not once or twice, but year after year. They have found that Permite delivers the quality of metals, the rugged strength and maximum performance expected . . . every time.

For over thirty years Permite engineers have cooperated with automotive and industrial engine builders in developing valves, pistons and other parts to achieve new standards of engine performance. We invite consultation on your requirements.

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Today, thanks to recent developments in spray guns and material handling pumps, you can use spray guns for more jobs than ever before.

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even flock on Christmas trees.

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Binks Manufacturing Co., 3120-30 Carroll Ave. West
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COMPANY

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(Continued from page 154)

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.

Spares, B-29—\$403,392
Indicator—1904 ea—\$148,401
Test equipment—Various—\$32,716
Indicator—274 ea—\$48,959
Fuel flowmeter—234—\$124,739
359

Airspeed and mach—\$130,099
Indicators—553

Fuel pressure indicators—90—\$34,385
Fuel pressure transmitters—197

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.

Torque meter indicators—1035—116,939

Torque meter transmitters—641

Gyro horizon indicators—1137—\$893,258

Electric direct cranking starters—1490—\$473,447

114—\$40,207

Thomas A. Edison, Inc., West Orange, N. J.

Gage, engine unit—1669 ea—\$154,869

Electric-Auto Lite Company, Toledo, Ohio

Spare parts—Various—32,485

Electric Storage Battery Company, Philadelphia, Pa.

Battery—2874 ea—\$129,980

— F —

Fairbanks-Morse Company, Chicago, Illinois

Spare parts—Various—\$72,309

Fairbanks-Morse Company, Beloit, Wisconsin

Spare parts—Various—\$35,502

Fairbanks Morse & Co. Beloit Works, Magneto Div., Beloit, Wis.

Magneto—2060 ea—\$96,846

Fairchild Engine & Airplane Corp., Fairchild Aircraft Div., Hagerstown, Md.

Spares—\$27,133

Fairchild Engine Div., Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

Power plants—\$85,630

Fargo Motor Corp., Washington, D. C.

Trucks, cab and chassis—188 ea—\$318,265

Light trucks—6 ea—\$17,056

Firestone Tire & Rubber Company, Akron, Ohio

Track—33,000—\$3,405,600

The Firestone Tire & Rubber Co., Akron, Ohio

Tires & tubes—1300—\$38,422

Firestone Tire and Rubber Company, World Bestos Div., New Castle, Ind.

Vehicle parts—36,000—\$121,710

Ford Motor Company, Ford Division, Washington, D. C.

Automobiles—108 ea—\$152,096

— G —

The Gabriel Company, Cleveland, Ohio

Vehicle parts—4000—\$43,600

The Gabriel Company, Cleveland, Ohio

Vehicle parts—2500—\$27,512

Gates Rubber Company, Sales Div., Inc., Detroit, Mich.

Tires & tubes—4810—\$123,534

General Electric Company, Schenectady, New York

Indicator—1670 ea—\$162,365

Indicator—1512 ea—\$65,611

Tachometer indicators—1037—\$106,734

General Electric Company, Syracuse, New York

Indicator—28 ea—\$350,721

(Turn to page 158, please)

SIMPLICITY in hydraulic pump design is important for these reasons:

The Pesco hydraulic pump is a gear design—the simplest of all hydraulic pumps. There are actually only three moving parts in the pump proper. Fewer moving parts mean—

- ... *less chance of pump malfunction*
- ... *less maintenance*
- ... *less cost for overhaul*
- ... *less weight*
- ... *less noise*

plus the EFFICIENCY of "Pressure Loading" which makes possible:

"Pressure Loading" is Pesco's exclusive development that *automatically* holds end clearance of gears to a thin film of oil, thereby maintaining the volumetric efficiency throughout the long service life of the pump.

- ... *volumetric efficiencies up to 97%
over a wide range of temperatures*

plus STATISTICAL QUALITY CONTROL which assures:

- ... *uniform high quality and performance of each pump*
- ... *a longer, trouble-free service life*

Simplicity of design, efficiency of "Pressure Loading" and statistical quality control in all phases of manufacture, are three important reasons why Pesco pumps are standard equipment on military and commercial aircraft and on many automotive and industrial products. Write today regarding your hydraulic pump requirements.



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Korfund Vibration Control has paid off in dollars and cents for thousands of manufacturers, because Korfund units reduce transmitted vibration and:

- Permit more efficient plant layouts
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- Permit installations without reinforcement of floors
- Reduce rejects, improve work quality
- Reduce maintenance costs
- Lengthen building and machine life
- Increase machine speed and production
- Insure quieter unit operation—less operator fatigue

We'll gladly send more information on Korfund Vibration Control for presses, machine tools, hammers, compressors, and other mechanical equipment. Write today for your free copy of Bulletin #1, or see our catalog in Sweet's Files.

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In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

(Continued from page 156)

General Electric Company, Phila., Pa.
Maintenance parts—Various—\$317,319
Indicator—639 ea—\$88,023
General Electric Company, Lamp Division, Philadelphia, Pa.
Lamps—Various—\$26,978
General Motors Corp., Foreign Distr. Div., New York, N. Y.
Light trucks—13 ea—\$18,384
General Motors Corp., Pontiac Motor Div., Detroit, Mich.
Automobiles—5 ea—\$10,265
General Motors Corp., Pontiac Motors Div., Pontiac, Mich.
Hardware—20—\$37,220
General Motors Corp., United Motors Service, Detroit, Mich.
Hardware—\$50,374
Spare parts—Various—\$36,143
Vehicle parts—6000—\$139,020
General Motors Corp., United Motors Serv., Detroit, Mich.
Vehicle parts—17,700—\$80,552
Spare parts—Various—\$52,379
Vehicle parts—26,000—\$35,360
The General Tire & Rubber Company, Akron, Ohio
Tires & tubes—170—\$44,660
The B. F. Goodrich, Akron, Ohio
Wheel easy—Various—\$300,801
Tires & tubes—250—\$44,832
Goodyear Aircraft Company, Akron, Ohio
Spare parts—Various—\$225,785
Gould-National Batteries, Inc., Washington, D. C.
Battery—1743 ea—\$67,881
Gray-Marine Motor Co., Detroit, Mich.
Spare parts—Various—\$52,284
The Grote Manufacturing Co., Inc., Bellevue, Kentucky
Vehicle parts—18,000—\$267,460

—H—

Harnishfeger Corp., Milwaukee, Wis.
Spare parts—Various—\$38,374
Hercules Motors Corp., Canton, Ohio
Spare parts—Various—\$28,699
Spare parts—Various—\$44,498
Spare parts—Various—\$106,052
Hiller Helicopter Co., Palo Alto, Calif.
Services and Materials—Various—\$57,339
Holley Carburetor Company, Detroit, Mich.
Fuel control—50 ea—\$149,500
Hoof Products Company, Chicago, Illinois
Hardware—1450—\$32,059

—I—

Industrial Supply Co., Detroit, Mich.
Replenishment of hardware—1,566,000—\$29,289
Hardware—29,460,000—\$152,662
International Harvester Company, Melrose Park, Illinois
Loader—26 ea—\$327,241
International Harvester Co., Industrial Power Div., Melrose Park, Ill.
Spare parts—Various—\$237,062
International Harvester Company, Washington, D. C.
Trucks—11 ea—\$43,635

—J—

Jack & Heintz, Inc., Cleveland, Ohio
Generator, tachometer—1859 ea—\$77,552

—K—

Kelsey-Hayes Wheel, Detroit, Mich.
Vehicle parts—60,000—\$168,180
Kelsey-Hayes Wheel, Detroit, Mich.
Vehicle parts—12,000—\$27,720
Vehicle parts—9000—\$31,783
(Turn to page 160, please)

THERE'S MORE TYPE 430

Stainless Steel trim

**ON THE 1953 MODELS
THAN EVER BEFORE**

● Year after year, the use of straight-chromium Type 430 Stainless Steel for interior and exterior trim has been increasing steadily. And it hits a new high on the 1953 models of almost every manufacturer.

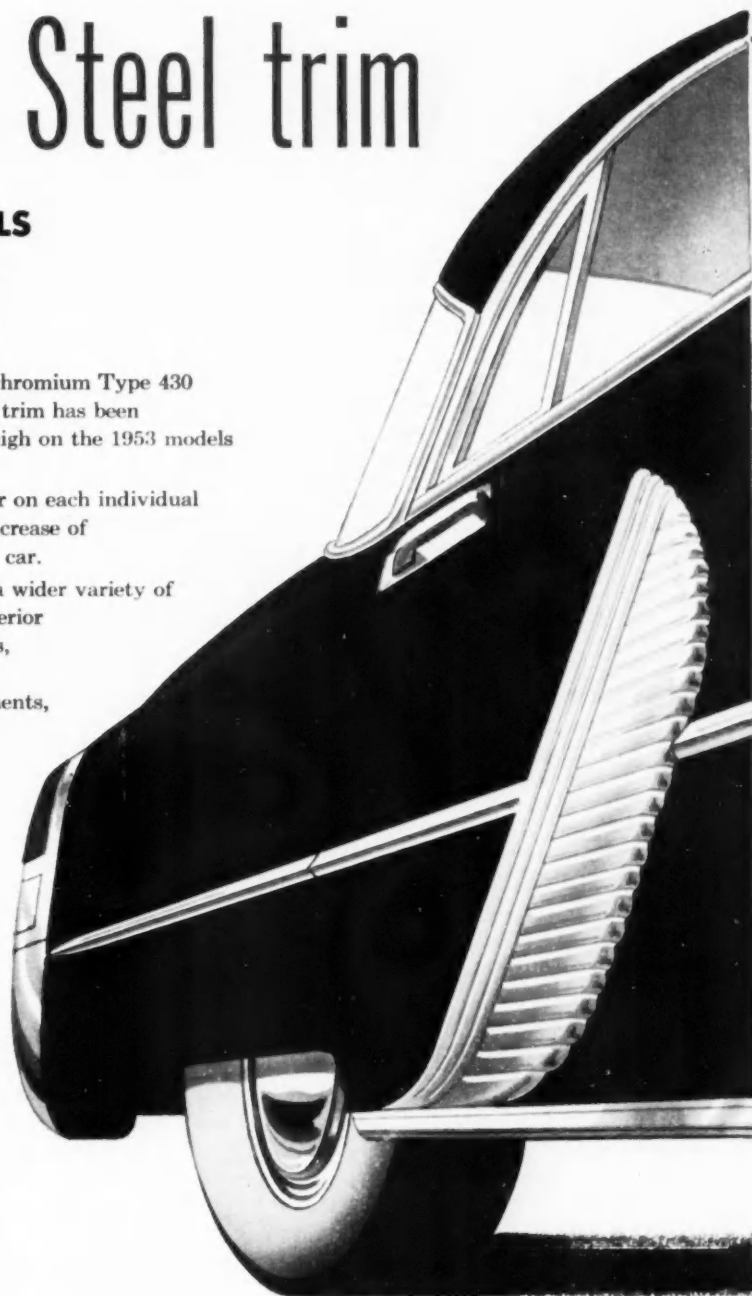
There's more Stainless Steel this year on each individual car . . . one manufacturer reports an increase of more than 25% in Stainless weight per car.

And Stainless Steel is being used in a wider variety of applications, including interior and exterior mouldings, glass channels, wheel covers, hub caps, lamp doors, radiator grilles, door handles, radiator and hood ornaments, stone shields and many more.

Stainless Steel trim is enthusiastically received by car buyers who recognize that its beauty is more than skin deep. Its lasting corrosion resistance and dense, durable surface keep it looking new a long time.

New finishing facilities have helped to speed this switch to Stainless Steel. U·S·S 17 (Type 430) Stainless Steel, used extensively for these applications, is furnished in strip form with a bright mill finish that requires minimum polishing after forming.

For the finest performance, insist on U·S·S 17 Stainless Steel. Our representatives will be glad to work with you in selection of materials and forming methods that best meet your design requirements.



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SPLINE TYPE



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Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts never work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study your fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

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GREER STOP NUT CO.
2620 Flournoy, Chicago 12, Ill.



GREER Stop Nuts

(Continued from page 158)

Keystone Bolt & Nut, New York, N. Y.
Hardware—28,947—\$3,565
Kiekhaefer Aeromarine Motors, Inc.,
Fond du Lac, Wis.
Spare parts—Various—\$25,377
Koehler Aircraft Products, Dayton, Ohio
Fuel valves—Various—\$50,104
Valves—Various—\$32,194
Kramer Mach. & Engineering Products
Co., Leavenworth, Kansas
Hardware—2000—\$158,760

— L —

Lamson & Sessions Company, Cleve-
land, Ohio
Hardware—227,500—\$40,335
Lear, Inc., Grand Rapids, Mich.
Actuators—143 ea—\$91,911
Lear, Inc., Romeo Div., Elyria, Ohio
Pump assys.—Various—\$161,861
Lee Rubber & Tire Corp., Consho-
hocken, Pa.
Tires—17,050,000—\$418,019
Le Roi Company, Cleveland Rock
Drill Div., Cleveland, Ohio
Spare parts—Various—\$77,425
R. G. Le Tourneau, Peoria, Illinois
Spare parts—Various—\$96,583
Lewis Engineering Company, Nauga-
tuck, Conn.
Indicator—1089 ea—\$185,031
The Lewis Engineering Company, Nau-
gatuck, Connecticut
Indicator—Various—\$75,900
Indicator—\$149,927
Liquidometer Corp., Long Island City,
N. Y.
Indicator & transmitter—463 ea—\$59,074

Lockheed Aircraft, Burbank, Calif.
Universal aerolift—10 ea—\$183
Hydraulic valve—Various—\$36,980
Lockheed Aircraft, Burbank, Calif.
Spare parts—Various—\$95,462
Spare parts—Various—\$230,207
Lord Manufacturing Company, Erie,
Pa.
Maintenance part—Various—\$34,489

— M —

McDonnell Aircraft, St. Louis, Mo.
Parts—Various—\$63,295
Mackenzie Muffler Company, Inc.,
Youngstown, Ohio
Vehicle parts—4800—\$50,440
Mansfield Tire Company, Mansfield,
Ohio
Tires—2400—\$424,036
Tires—2780—\$67,552
Tires—2500—\$111,915
Maremont Automotive, Chicago, Ill.
Torsion bars—1554—\$69,153
Marine Iron Works, Inc., Tacoma,
Washington
Vehicle parts—2000—\$58,556
Marlin-Rockwell Co., Jamestown, N. Y.
Replenishment of hardware—3000—\$25,140
Vehicle parts—1300—\$34,983
Glenn L. Martin Company, Baltimore
3, Md.
Maintenance parts—Various—\$221,553
Maintenance parts—various each—\$134,580
Stack and support assy.—Various each—\$190,648
Michigan Bolt & Nut, Detroit, Mich.
Replenishment of hardware—1,010,000—\$32,802
Hardware—34,600—\$4000

— N —

Nash Engineering Company, South
Norwalk, Conn.
Pump assy.—95 ea—\$105,009
(Turn to page 162, please)

650° F.

STEADY OR WITH RAPID FLUCTUATIONS MYCALEX INSULATION CAN TAKE BOTH OF THOSE TEMPERATURE CONDITIONS

It holds inserts tightly, and moves with the metals around it, because it has very nearly the same coefficient of thermal expansion as the most important metals of which inserts and casings are made.

DESIGNER! UNCHAIN YOUR IMAGINATION!

The destructive effects of high operating temperatures, high ambient temperatures, thermal expansion as between metals and insulations, have caused you to make too many items too much bigger and heavier than they need to be.

MYCALEX glass-bonded mica also is dimensionally stable, corona resistant, does not carbonize under arc, has no moisture absorption.

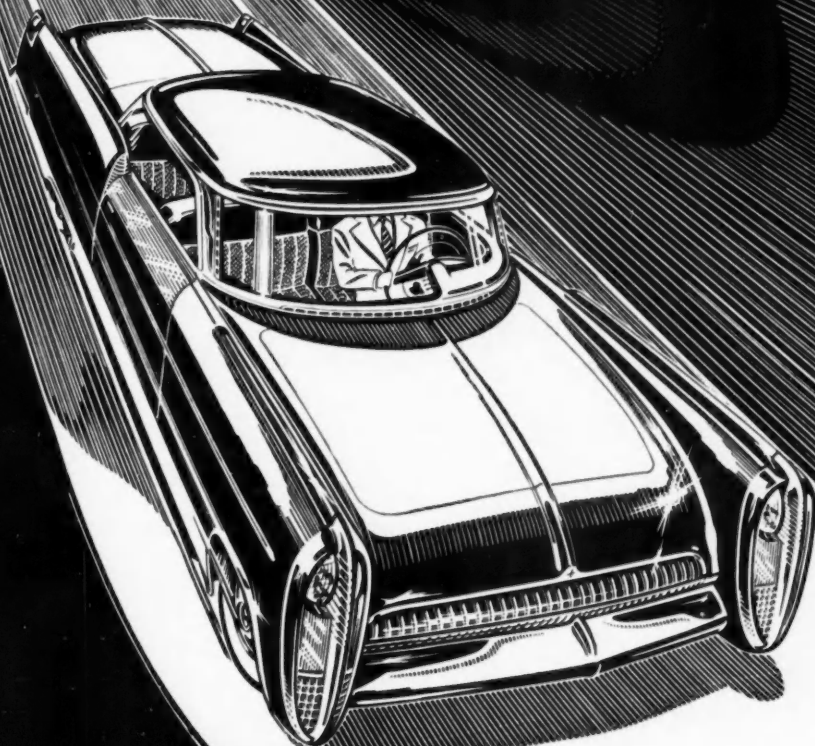


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Passenger cars of the future will require radical new advancements! *45 years* of precision engineering service to car manufacturers enables *Kelsey-Hayes* to keep pace with the future need for quality parts for ever greater *safety and performance!*

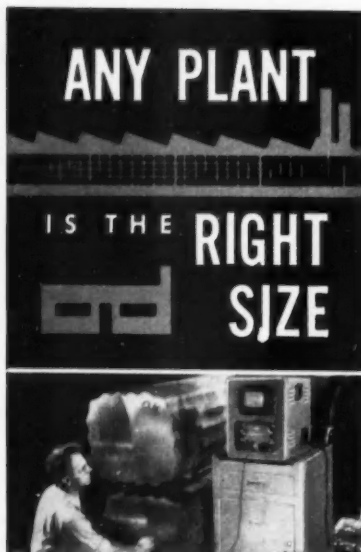
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TITLE _____
COMPANY _____
CO. ADDRESS _____
CITY _____
ZONE _____ STATE _____

(Continued from page 160)

National Mach. Co., Utica, Mich.
Replenishment of hardware—3,050,000—\$26,836
National Mach. Products, Utica, Mich.
Hardware—287,600—\$52,496
National Motor Bearing Company, Inc., Redwood City, Calif.
Hardware 149,451—\$68,882
New York Air Brake Company, New York, N. Y.
Hydraulic pump assemblies—Various—\$17,610
North American Aviation, Inc., Fresno, Calif.
Maintenance parts—Various—\$120,694

— O —

Oliver Corp., South Bend, Ind.
Spare parts—Various—\$96,498
Osgood Company, Marion, Ohio
Crane—12 ea—\$680,004
Oshkosh Motor Truck, Inc., Oshkosh, Wis.
Truck, cab and chassis—2 ea—\$26,370

— P —

Pittsburgh Forgings, Coraopolis, Pa.
Vehicle parts—6000—\$35,640
Pneu-Hydro, Cadillac, Michigan
Vehicle parts—204—\$29,300
Vehicle parts—4600—\$227,480
Purolator Products, Inc., Rahway, N. J.
Filter—18,385 ea—\$47,046
Filter & restrictor assys.—Various—\$39,220

— R —

Republic Aviation Corp., Farmingdale, L. I., N. Y.
Implementation of airplane—\$1,000,000
Radio set—\$50,844
Rockford Clutch Div., Borg-Warner Corp., Rockford, Ill.
Spare parts—Various—\$33,920
Royal Electric, Inc., Jamestown, Ohio
Generators—400 ea—\$50,600
The Ryan Aeronautical, San Diego, Calif.
Stack assy.—Various—\$30,371

— S —

Schramm, Inc., West Chester, Pa.
Spare parts—\$27,049
Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y.
Parts, magneto—\$531,982
Seiberling Rubber Company, Akron, Ohio
Tires—9000—\$231,795
Seiberling Rubber Company, Akron, Ohio
Replenishment of tires—5000—\$49,500
Skinner Purifiers Div., Bendix Aviation Corp., Detroit, Mich.
Filter assy.—1740—\$43,132
Solar Aircraft Company, San Diego, Calif.
Support assy.—Various—\$49,096
Sperry Gyroscope, Company, Div. Sperry Corp., Great Neck, N. Y.
Maintenance parts—Various—\$36,876
Stewart-Warner Corp., Chicago, Ill.
Tool—100—\$39,486
Stover Lock-Nut & Machinery Corp., Easton, Pa.
Replenishment of hardware—5,860,000—\$66,444
Hardware—750,000—\$28,875

(Turn to page 164, please)

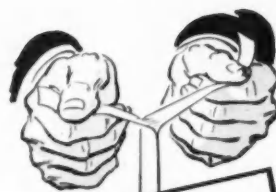
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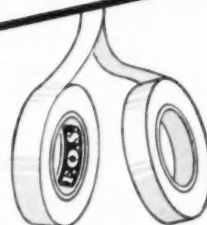
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That's what they're saying about the new F.O.S. Masking Tapes with "anchored bonding," the strongest bond yet developed between adhesive and backing.



MAKE THIS SIMPLE TEST

Unroll six inches of the tape you are using. Unroll a similar length of a comparable F.O.S. Tape. Adhere the two tapes, adhesive to adhesive. Now strip them apart. The superior bonded anchorage of the F.O.S. Tape "picks off" the adhesive of the competitive tape. Try this test—pick the winner.



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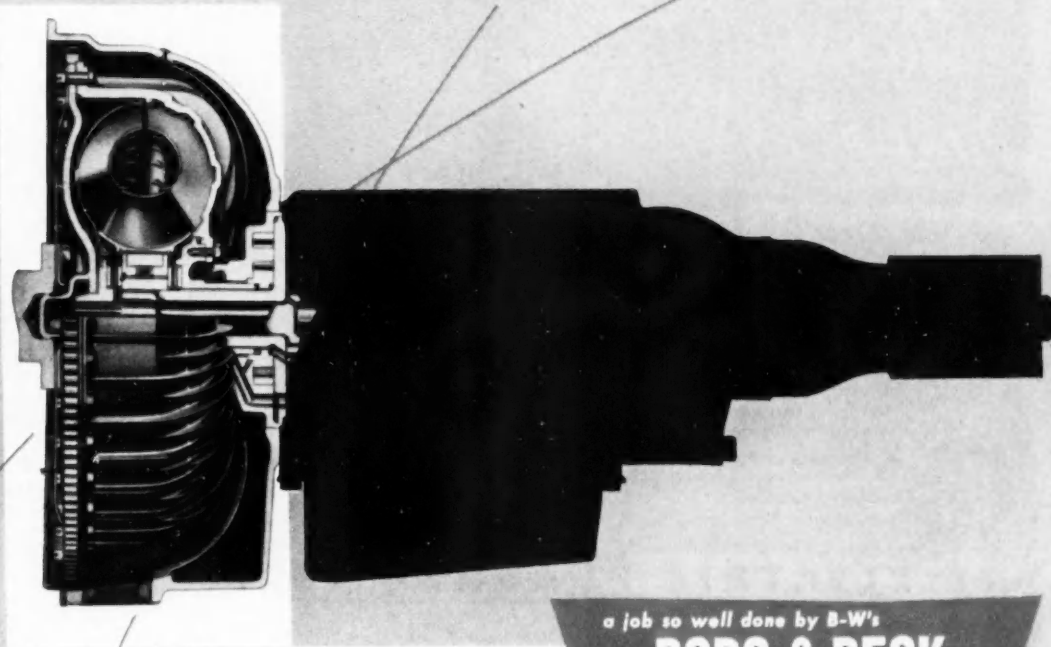
For production, assembly, packaging or shipping, you can save time and money with F.O.S. Industrial Tape. Ask an F.O.S. Tape Analyst to help you with special tape problems.

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Borg-Warner's Borg & Beck clutches for standard automotive transmissions are known and used the world over. With the swing to automatic transmissions, Borg & Beck was ready again with the perfected Borg & Beck torque converter for that vital spot where power takes hold of the load.

On leading makes of cars with automatic transmissions, power is transferred by this new, unique, simplified converter. Exceptionally light in weight, air cooled, with a torque ratio of 2.1 to 1, it is highly efficient, remarkably dependable in helping to put the "automatic" in automatic transmissions.

This is one more outstanding example of how "Borg-Warner engineering makes it work—Borg-Warner production makes it available." It is a typical example of how Borg-Warner serves the automotive industry—and the American public—every day.

ALMOST EVERY AMERICAN BENEFITS EVERY DAY FROM THE 185 PRODUCTS MADE BY **BORG-WARNER**



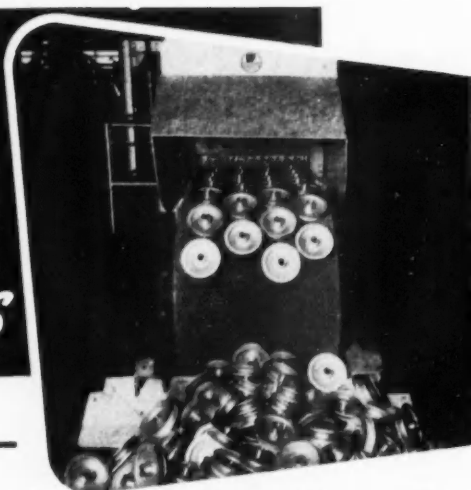
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B-W production makes it available*

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or Electric —



cut material, tooling and finishing costs

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Precision Plastic Fabricators

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(Continued from page 162)

The Studebaker Corp., South Bend, Ind.
Truck, cargo—112 ea—\$803,582
Trucks—6
Sets spare parts

— T —

Thermoid Company, Trenton, New Jersey
Vehicle parts—30,000—\$41,400
Triplex Corporation of America, Pueblo, Colorado
Vehicle parts—55,000—\$281,600
Tungsten Contract, Inc., North Bergen, New Jersey
Vehicle parts—150,000—\$225,350

— U —

Unit Crane & Shovel, Milwaukee, Wis.
Spare parts—Various—\$69,760
United Aircraft Corp., Dallas, Texas
Maintenance parts—Various—\$122,880
United Aircraft Corp., Chance Vought Aircraft Div., Dallas, Tex.
Parts for F4U aircraft—Various—\$63,962
Maintenance parts—Various—\$328,093
United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Spare parts for J57-P—Various—\$1,961,080
Items for engines—Various—\$89,151
Spare parts for J57-P—Various—\$3,552,452
United States Rubber, Fort Wayne, Indiana
Rubber grouser track—6 pr—\$23,928
United States Rubber Company, Detroit, Mich.
Tires and tubes—2800—\$27,406

— V —

Varney Heat Treating Company, Detroit, Mich.
Vehicle parts—60,000—\$159,000

— W —

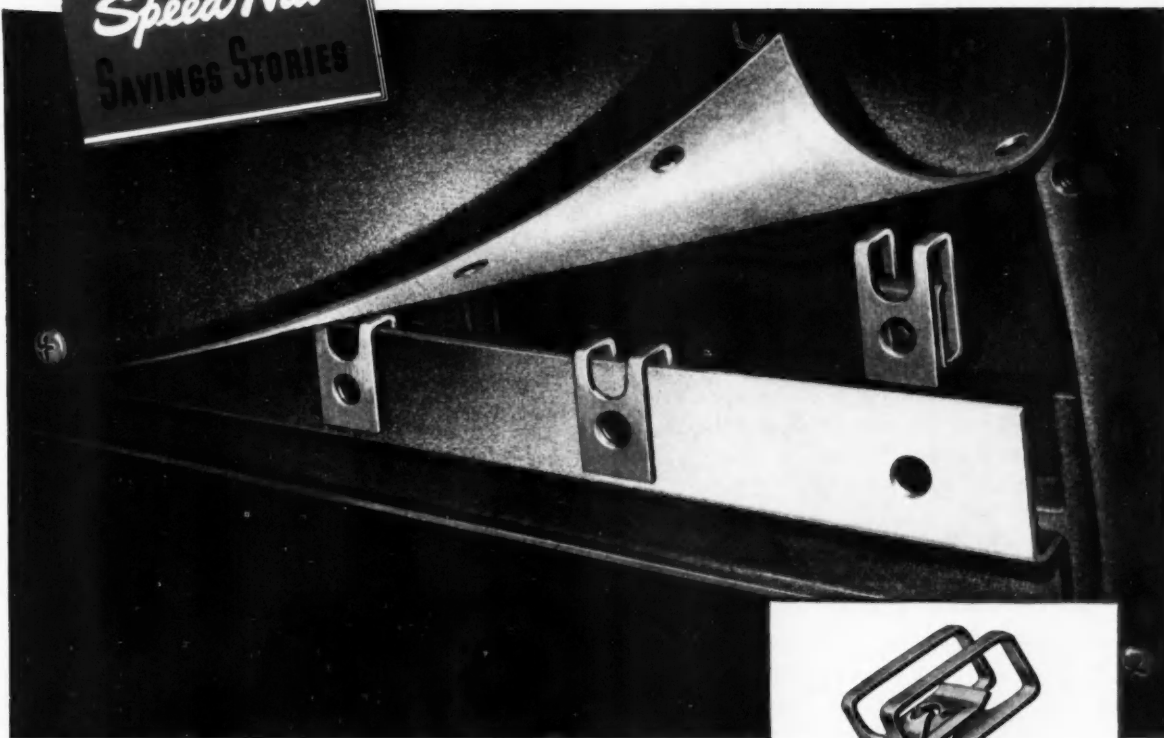
The Weatherhead Company, Cleveland, Ohio
Hose—Various feet—\$30,203
Welson Tool Company, Cleveland, Ohio
Pump assy.—690 ea—\$52,380
Westinghouse Electric Corp., Aviation Gas Turbine Div., Philadelphia, Pa.
Parts—Various—\$82,881
Westinghouse Electric, Aviation Gas Turbine, Phila., Pa.
Maintenance parts for J40—Various—\$335,303
Weston Hydraulics, North Hollywood, Calif.
Sleeve assy.—855 ea—\$30,780
W. R. Whittaker Company, Los Angeles, Calif.
Fuel valve—395 ea—\$157,023
Willys Overland Motors, Toledo, Ohio
Hardware—61,298—\$18,600
Willys-Overland Motors, Toledo, Ohio
Trucks—8 ea—\$13,692
Wire Assemblies Corp., Detroit, Mich.
Vehicle parts—2500—\$43,150
Wisconsin Motor Corp., Milwaukee, Wis.
Spare parts—Various—\$57,361
Yankee Metal Prod., Norwalk, Conn.
Vehicle parts—10,000—\$115,560
Warner Gear Division, Muncie, Indiana
Vehicle parts—10,000—\$57,700

— Z —

Zenith Carburetor, Bendix Aviation Corp., Detroit, Mich.
Vehicle parts—2000—\$47,240



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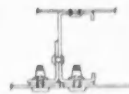
Considered in terms of industry-wide aircraft production... savings and production boosts like these can mean millions of dollars. For similar solutions to fastening problems you may have, see the Tinnerman representative in your area!



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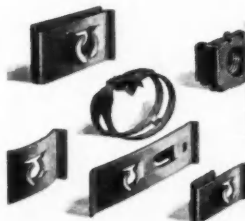
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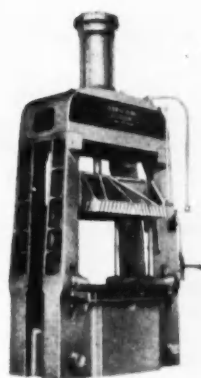
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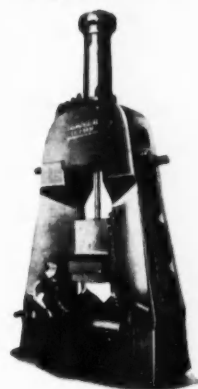
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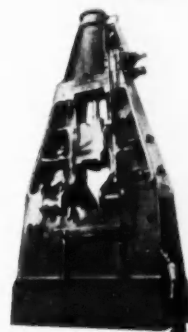
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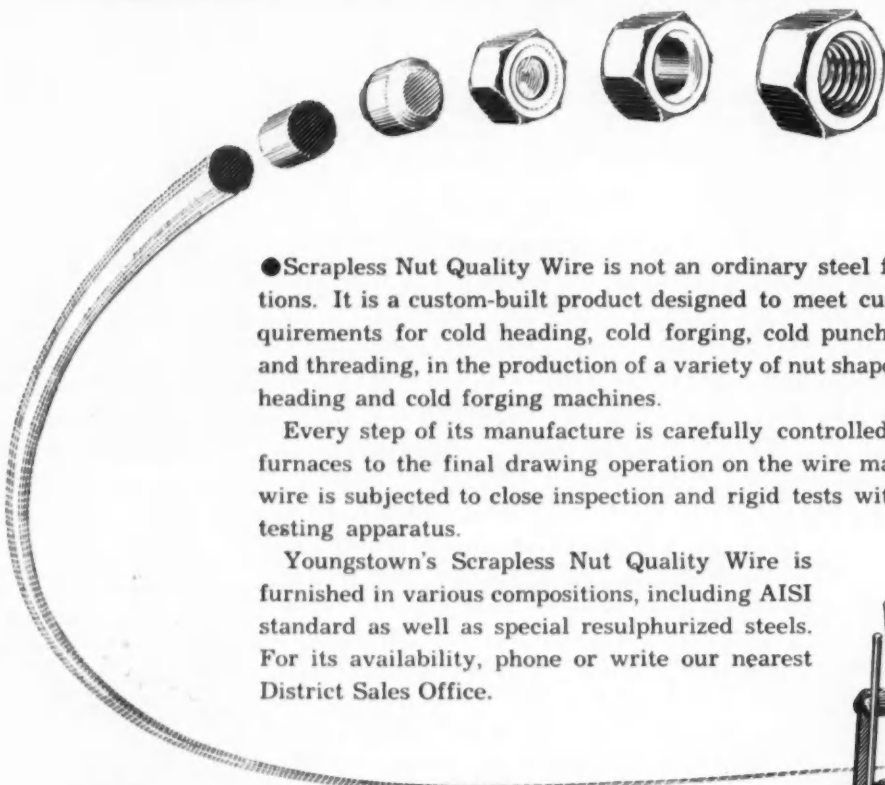
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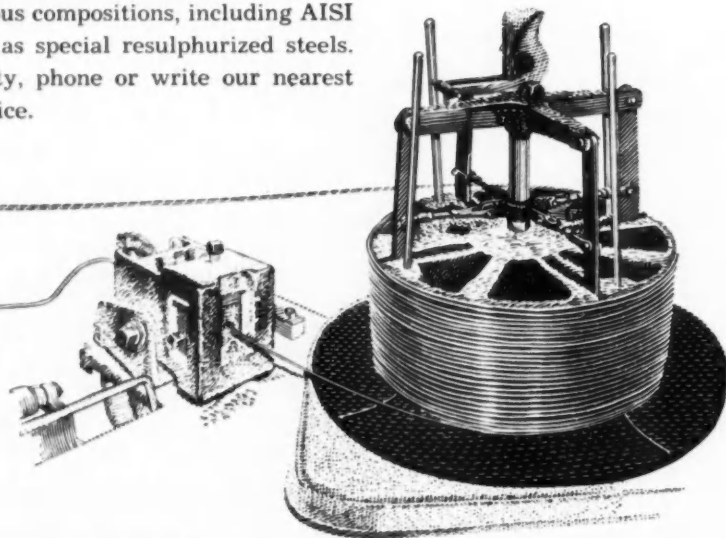
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NATIONAL OIL SEAL LOGBOOK

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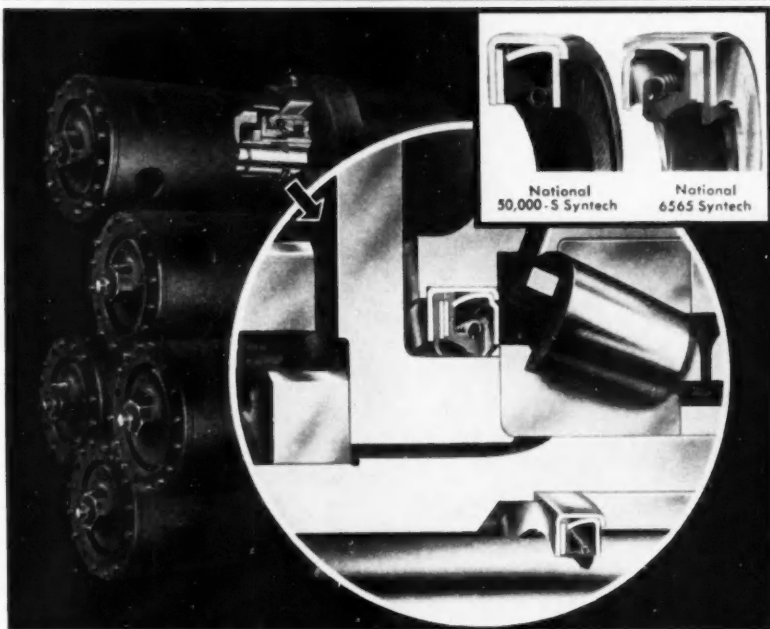


Fig. 1—Tournamatic Transmission Assembly

Concentrically-mounted National Oil Seals provide efficient sealing in Le Tourneau automatic clutch

The Le Tourneau Super C Tornadoizer utilizes a constant-mesh, instant-shift transmission ruggedly designed with short, heavy shafts, helical-cut gears and anti-friction bearings. To protect gears and bearings and prevent lubricant leakage, ten National Oil Seals are installed in each transmission.

The transmission assembly (Figure 1) has five different shaft assemblies, and each utilizes two National seals mounted concentrically. The inner seal in each assembly is a standard-design National 50911-S Syntech* unit with a spring-tensioned synthetic rubber sealing member. It operates on an 870 r.p.m. (maximum) shaft hardened to 58-62 Rockwell and finished to ± 0.0005 . Its function is to protect the clutch from heavy gear oil.

At the outer position, Le Tourneau uses a special National 6565 Syntech seal with a conventional spring-loaded main sealing member to retain bearing grease and a springless external lip to exclude dirt and water. This seal has a

*Trade Mark Registered

steel O.D. which fits into the retainer.

In solving these sealing problems, Le Tourneau and National Applications Engineers worked together, utilizing both standard-design and special National seals. In many cases, standard-design National seals solve problems quickly and economically; other applications may demand modifications to meet special conditions. In either event, National can offer you on-the-spot engineering help backed by 30 years of experience in solving sealing problems. Call the nearest National Applications Engineer for consultation.



Fig. 2—Super C Tornadoizer

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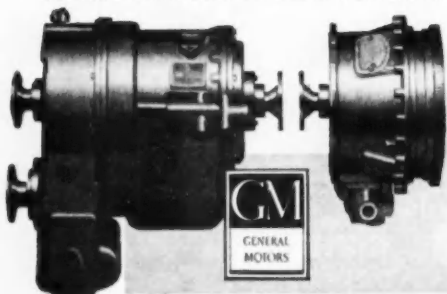
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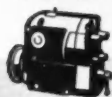
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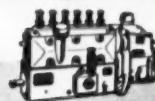
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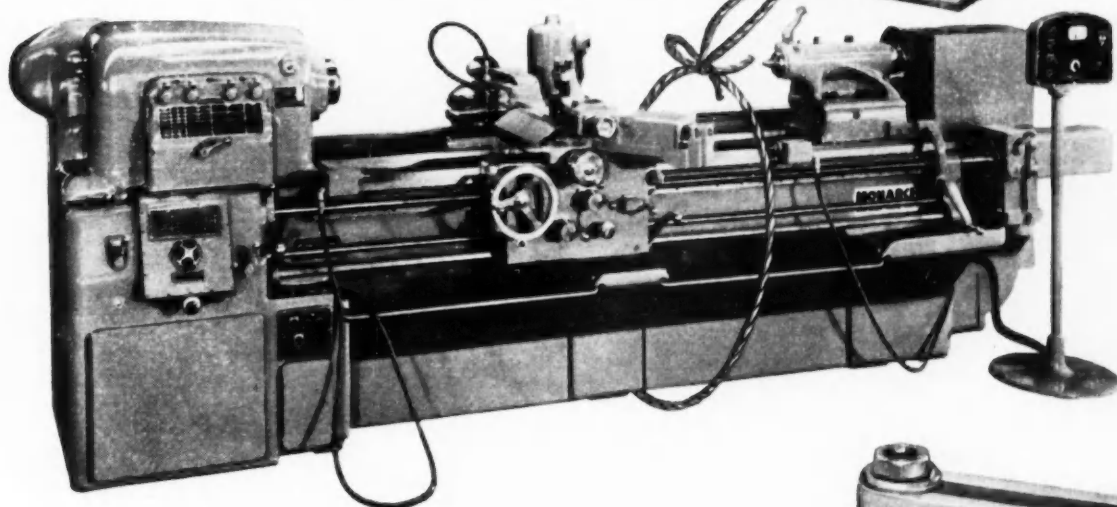
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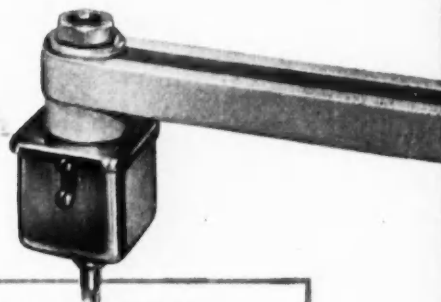
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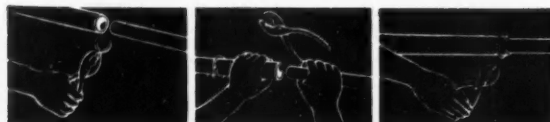
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*Walter Tydon, widely known aviation engineer and aircraft designer and veteran of 25 years in aviation, is Chief Engineer of Fairchild's Aircraft Division.



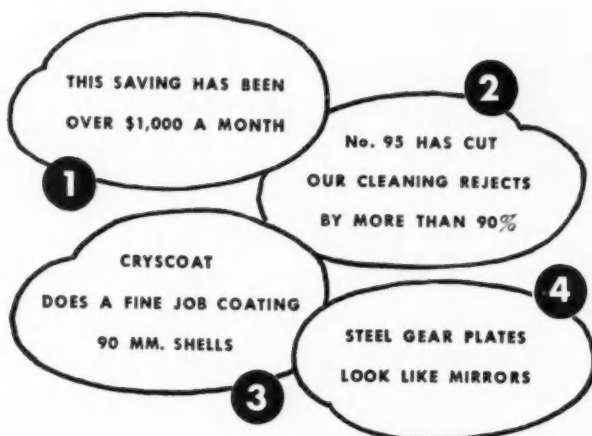
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- 2 The use of Oakite Composition No. 95 for conditioning zinc-base die castings before plating cut cleaning rejects for this hardware manufacturer and showed other "very fine advantages."
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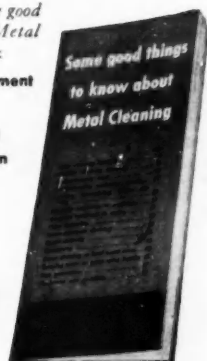
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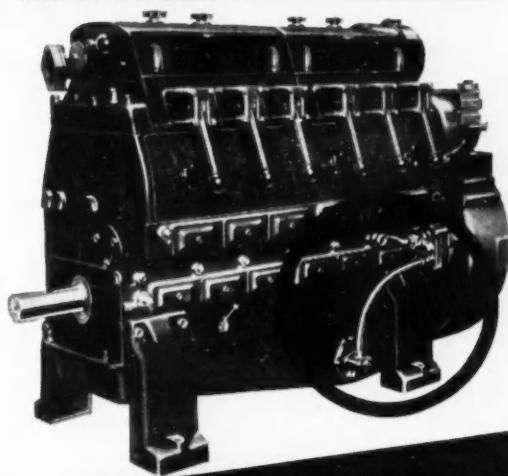
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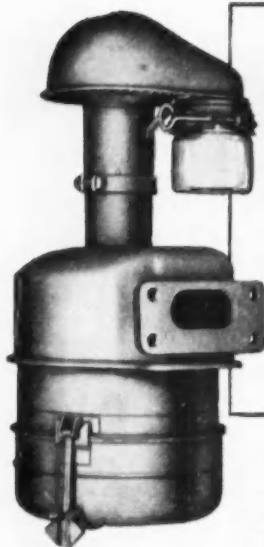
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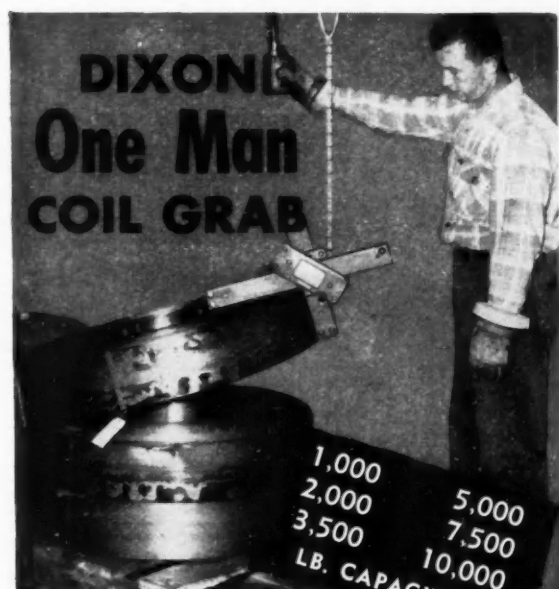
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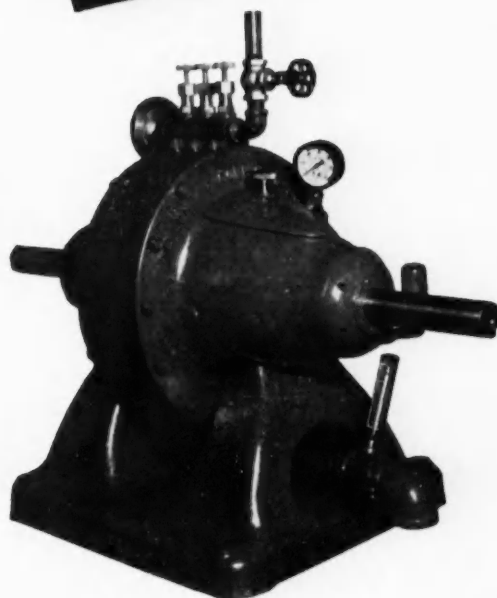
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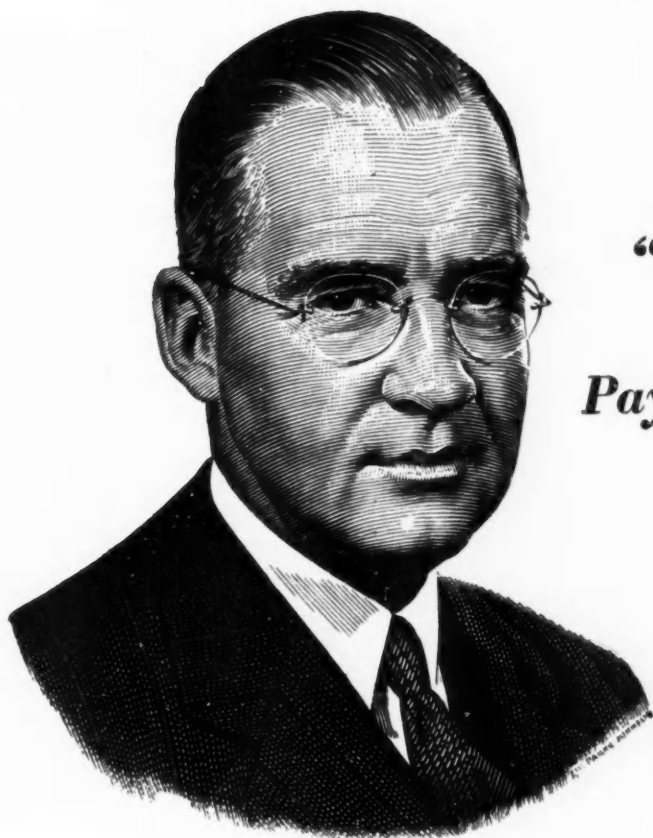


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SPECTACULAR PERFORMANCE

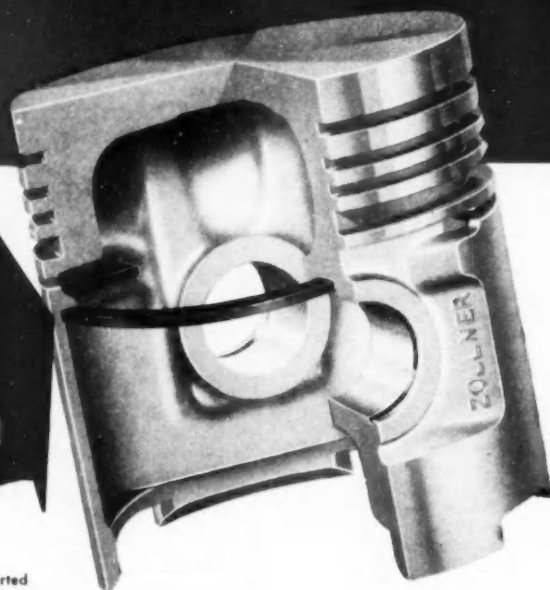
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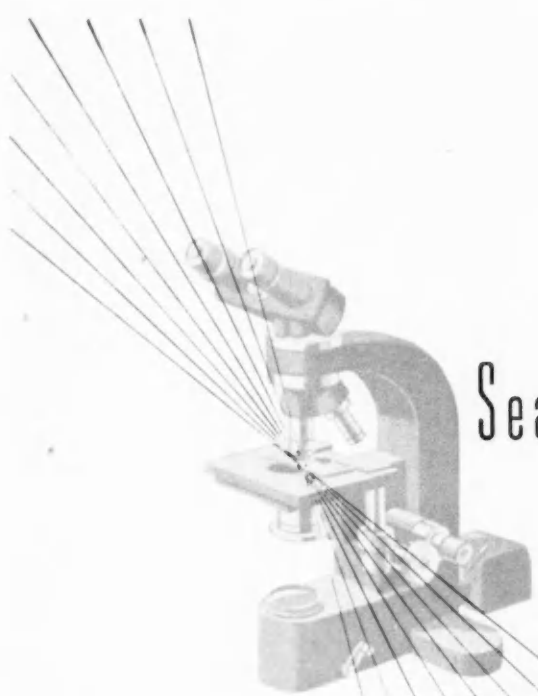
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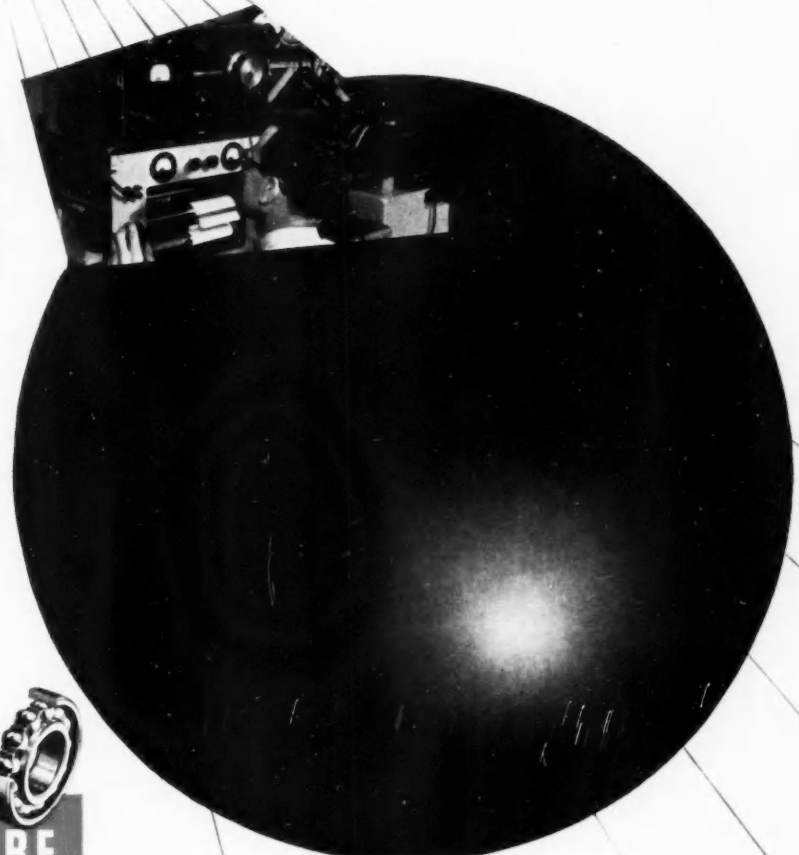
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